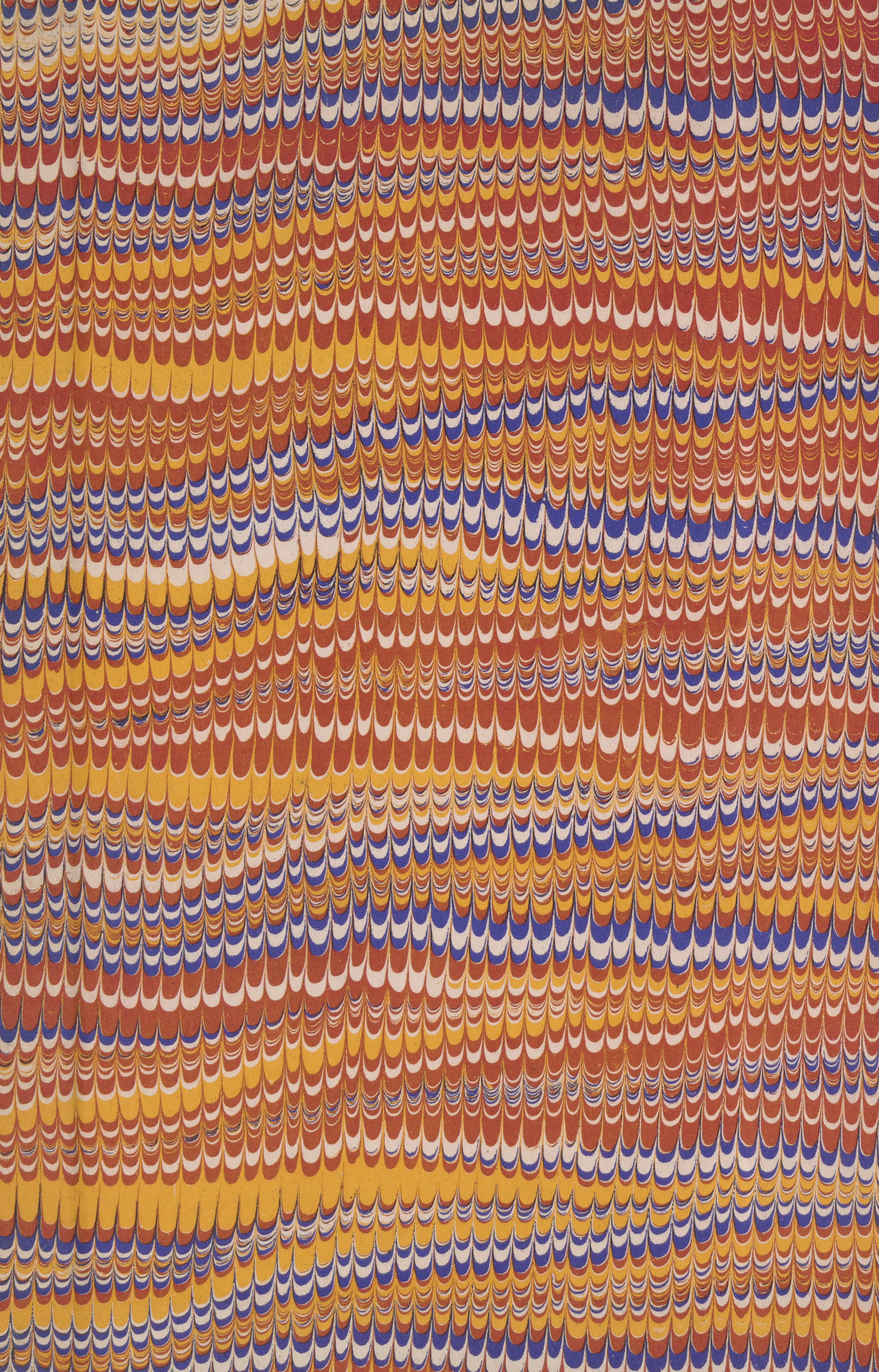

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BULLETIN

OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

Vol. XXV, 1908–1915

EDITOR, J. A. ALLEN

NEW YORK
PUBLISHED BY ORDER OF THE TRUSTEES
1908–1915

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DATES OF PUBLICATION OF SEPARATA[1]

The edition of separata is 300 copies, of which about 100 are mailed on the date of issue, and the others placed on sale in the Library.

Art. I, June, 1908
Art. II, January 4, 1915

LIST OF NEW GENERA AND SPECIES DESCRIBED IN THIS VOLUME

New Genera

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[1] The Title-page and Table of Contents of this volume (XXV) published ....July 7, 1938.

ERRATA

Page 106, line 5 from bottom: for *Rhinesuchus* read *Myriodon.*
“ 107, line 21 from top: for Dromasaurians read Dromasauria.
“ 107, line 3 from bottom: *Dicyondon* read *Dicynodon.*
“ 108, line 6 from top: for Atherstonia read *Atherstonia.*
“ 108, line 20 from bottom: for Diaptosaurians read Diaptosauria.
“ 115, line 8 from top: for Joubert read Rev. Mr. Joubert.
“ 116, line 11 from bottom: for relatively small and slender read moderately well developed.
“ 117, line 13 from top: for J. T. R. Scholtz read T. J. R. Scholtz.
“ 117, line 16 from top: for regions read region.
“ 118, line 14 from bottom: for Mek read Nek.
“ 119, line 15 from top: for mandibles read mandible.
“ 120, line 12 from top: for small read fair-sized.
‘ 126, line 12 from top: for Neiuweveld read Nieuweveld.
“ 132, line 5 from top: for Nieuwveld read Nieuweveld.
“ 135, line 3 from bottom: for Figs. 26, 27 read Fig. 26.
“ 136, line 4 from top: delete the sentence “Also Amer. Mus. Journ., Vol. XIV, p. 136, April, 1914.”
“ 138, caption: for Type, No. 5542 read Topotype, No. 5635.
“ 142, line 5 from bottom: for Nieuwveld read Nieuweveld.
“ 145, line 4 from top: for Graaf read Graaff.
“ 157, line 14 from top: delete the word “Figured.”
“ 157, lines 2 and 8 from bottom: for Winnarsbaken read Winnaarsbaken.
“ 157, lines 9 and 10 from bottom: delete both of these lines.
“ 159, line 3 from bottom: delete the word “Figured.”
“ 159, line 2 from bottom: delete the sentence “Figured in Amer. Mus. Journ., Vol. XIII, p. 346, December, 1913.”
“ 160, line 1 from bottom: for Collector, R. Broom read Collector, unknown.
“ 160, line 16 from bottom: for PHYTOSAURIA read PELYCOSOMIA.
“ 161, line 14 from top: for PSEUDOSUCHIA read EOSUCHIA.
“ 161, line 15 from top: for *Youngina gracilis* gen. et sp. nov. read *Youngina capensis* Broom, 1914.
“ 161, line 16 from top: delete “This new genus and species is founded on the” and insert “A.”
“ 161, line 4 from bottom: for 15 mm. read 17 mm.
“ 161, line 1 from bottom: for squamosal read tabular.

ADDENDA

Page 107, line 17 from bottom: for "probably the oldest known primitive Chelonian" read "possibly a form allied to the ancestral Chelonians."

" 115, after line 10 from bottom: insert "These dromasaurians are fully figured in connection with my Croonian Lecture, Philosophical Transactions, Royal Society, 1914."

" 116, line 7 from bottom: insert "There may have been 7 molars."

" 118, line 15 from bottom: add "elsewhere" to end of the line.

" 120, line 9 from top: insert "Locality, Beaufort West dist. Collector, J. H. Whaits."

" 124, at end of caption: insert "slightly restored."

" 136, caption: insert "and made a little too large posteriorly."

" 136, between lines 7 and 8 from bottom: insert

"Topotype 5635 (Fig. 27)	A skull and nearly complete skeleton of *D. platyceps*. All the skeleton except the skull and remains of the fore limbs were found in association and as mounted, except that the left hind limb lay almost directly backwards. The type skull and that mounted with this skeleton were found in the same stratum as the skeleton and each about a dozen yards from it, and about ten yards from each other. Either may be the skull belonging to the skeleton. The fore limb remains were also gotten in the same stratum, but some yards away. Figured in Amer. Mus. Journ., Vol. XIV, p. 136, April, 1914. Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom."

" 147, line 15 from top: add "Figured in Croonian Lecture, Phil. Trans., 1914."

" 156, between lines 6 and 7 from top: insert

"*Eocyclops longus* Broom, 1913.

Type	Fragmentary skull.
5636	Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, p. 441, Figs. 1, 2."

" 157, caption: delete "No. 5622" and insert "Figure of the type in the South African Museum, slightly restored."

" 159, line 1 from top and in caption for Fig. 46: for *Lycognathus ferox* read *Lycochampsa ferox.*

" 159, after the 1 on line 5 from top: insert "under the name *Lycognathus ferox.* As this generic name is preoccupied (Dumeril, 1853), it has been changed to *Lycochampsa.*"

" 159, caption for Fig. 47: for "Topotype, No. 5517." read "Restoration of the nearly perfect skull in A. Brown's collection which forms the type."

" 162, after line 15 from top: insert a new center heading, "SAUROPODA," and transpose the section on *Algosaurus bauri* from its present position to this new position.

GEORGE P. MERRILL
JUL 1 1908
DEPT OF GEOLOGY

BULLETIN

OF THE

American Museum of Natural History.

Volume XXV.

Catalogue of the Type and Figured Specimens of Fossil Vetebrates in the American Museum of Natural History.

Part I.—FISHES.

By L. HUSSAKOF.

SMITHSONIAN INSTITUTION
288470
SEP 8 1931
NATIONAL MUSEUM

New York:
Published by order of the Trustees.
June, 1908.

FOR SALE AT THE MUSEUM.

(Continued from 3rd page of cover.)

ETHNOGRAPHICAL ALBUM

Jesup North Pacific Expedition.

Ethnographical Album of the North Pacific Coasts of America and Asia. Part 1, pp. 1–5, pll 1–28. August, 1900. Sold by subscription, price, $6.00.

BULLETIN

The matter in the 'Bulletin' consists of about twenty-four articles per volume, which relate about equally to Geology, Palæontology, Mammalogy, Ornithology, Entomology, and (in the recent volumes) Anthropology, except Vol. XI, which is restricted to a 'Catalogue of the Types and Figured Specimens in the Palæontological Collection of the Geological Department,' and Vols. XV, XVII, and XVIII, which relate wholly to Anthropology. Vol. XXIII contains no anthropological matter, which now forms a separate series, as 'Anthropological Papers.'

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ANTHROPOLOGICAL PAPERS.

Vol. I, Nos. 1–3 1907

AMERICAN MUSEUM JOURNAL

The 'Journal' is a popular record of the progress of the American Museum of Natural History, issued monthly, from October to May inclusive. Price, $1.00 a year. Volumes I–VI, 1900–1906.

For sale at the Museum.

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BULLETIN

OF THE

AMERICAN MUSEUM OF NATURAL HISTORY.

VOLUME XXV, 1908.

CATALOGUE OF TYPES AND FIGURED SPECIMENS OF FOSSIL VERTEBRATES IN THE AMERICAN MUSEUM OF NATURAL HISTORY.

PART I.— FISHES.

BY L. HUSSAKOF.

PREFACE.

The Collection of Fossil Fishes now in the American Museum of Natural History includes at the present time upward of eight thousand specimens. It is an assemblage of smaller collections, of which the most notable are:

Newberry Collection.— Deposited in 1903, by Columbia University and representing the lifework of Professor John Strong Newberry (1822–1892), foremost palæichthyologist of America. It contains a large number of types from palæozoic horizons. Number of specimens.	3350
Cope Collection.— Presented to the Museum in 1900 by President Morris K. Jesup and others. This is next in importance to the Newberry Collection and is rich in types of tertiary fishes.	2450
Terrell Collection.— Presented to the Museum in 1899 by William Earle Dodge, Esq. It contains important "Placoderms" from the Devonian of Ohio, discoveries of Mr. Jay Terrell, formerly of Lorraine, Ohio.	175
James Hall Collection.— The fossil fishes brought together by Professor James Hall and belonging with his large and valuable palæontological collection acquired by the Museum in 1875.	150
Mt. Lebanon Collection.— Presented to the Museum in 1901 by the Rev. D. Stuart Dodge. This is entirely from the Cretaceous of Syria and includes the types of Dr. O. P. Hay (1903).	2100

Stuart Collection.— Presented to the Museum in 1877 by Robert L. Stuart Esq. It consists chiefly of a collection of fishes from the Triassic of Massachusetts, Connecticut, and New Jersey made by W. C. Redfield.	250
Kepler Collection.— Made by the Rev. Dr. William Kepler in the Devonian of Ohio, containing many valuable specimens of "Placoderms."	70
Hay Collection.— Brought together by Dr. O. P. Hay and including a number of figured specimens of teleosts from the Cretaceous of Kansas. Acquired in 1902.	60
Dodge Collection.— Numerous and important specimens secured through funds donated the Museum by Cleveland H. Dodge, Esq. From the same source collections have been obtained as the result of expeditions, *e. g.*, to the Devonian of Canada (1906), and to the Lower Carboniferous of Kentucky (1907).	250

During the past four years — since the time of the establishment of a curatorship of Fossil Fishes — these collections have been subjected to repeated revision. Material has been selected for a special exhibition gallery, which was opened to the public March 18, 1907: and the remainder has been classified, in many cases relabeled, and arranged as a study collection. In fact, under the system of arrangement adopted it is believed that any specimen in this considerable cabinet can now be obtained for reference in a minimal time. There has, however, been found constantly the need of a comprehensive catalogue of the collection, one giving further details than the card index and lists of the component collections. And, first of all, a catalogue seemed desirable of the numerous figured and type specimens at hand, for this would be of constant use to local workers as well as a permanent record accessible to other American and to foreign institutions. Accordingly Dr. Louis Hussakof, assistant in the Department of Vertebrate Palæontology, was commissioned to prepare the accompanying catalogue, and during the past year it has cost him a vast amount of tedious study, for the number of types involved proved greater than we had anticipated,— there are in round numbers 320 types and 240 figured specimens — and the citations have in many cases proved unusually troublesome. To his work have been added many illustrations of poorly figured or unfigured types, and, altogether, I am confident that his painstaking revision will be found of lasting value in the study of fossil fishes.

Bashford Dean,
Curator of Fossil Fishes.

American Museum of Natural History.
Jan. 4, 1908.

INTRODUCTION.

This catalogue enumerates the type and figured specimens of fossil fishes in the American Museum of Natural History. These are summarized in an appended table which shows a total of 562 such specimens, 323 types and 239 figured specimens other than types.

The present catalogue was arranged with a view to practical convenience rather than that of strict classification. To this end the genera, and under each genus the species, are enumerated alphabetically under the following heads:

Antiarcha		page	5
Arthrognathi		“	5
Incertæ sedis		“	21
Elasmobranchii	Pleuropterygii	“	24
	Ichthyotomi	“	28
	Plagiostomi	“	28
Holocephali		“	37
Incertæ sedis (Ptyctodontidæ)		“	41
Ichthyodorulites		“	43
Dipneusti		“	51
Teleostomi	Crossopterygii	“	54
	Actinopteri	“	59

A word in regard to the terminology of types. The terms used throughout this catalogue, *e. g.*, ‘type,’ ‘cotype’ and ‘paratype,’ are employed in the sense defined by Oldfield Thomas as quoted and emended by Prof. Chas. Schuchert.[1]

Type is retained for ‘holotype’ (Schuchert) and is used in the generally accepted sense of a single specimen, or one or more parts belonging to a single specimen, which is made the basis of a species.

Cotype — “one of two or more specimens, together forming the basis of a species, no type [*i. e.*, single specimen] having been selected.” (Oldfield Thomas).

Paratype — “a specimen belonging to the original series, but not the type, in cases where the author has himself selected a type. It should, however, be one of the specimens mentioned or enumerated in the original description.” (Oldfield Thomas.)

---

[1] Bull. U. S. National Mus., No. 53, Part I, 1905, pp. 9–12.

As is inevitable in collections of long slow growth changes in nomenclature have from time to time been found necessary as a result of new discovery. In all such cases the varying phases of opinion as expressed in the synonymy have been carefully traced, and in this catalogue, I believe, will be found reflected the present status of our knowledge. Cross-references from original to present names are given in all cases where the original names have been abandoned by previous writers or by the cataloguer.

These changes in nomenclature are indicated by typographical differences in the text. Names regarded as valid at the present time are printed in heavy face type thus: **Bothriolepis nitida** (Leidy); whereas rejected original names and synonyms are indicated, in the cross references, by small capitals, thus:

BOTHRIOLEPIS LEIDYI Newberry. See *B. nitida* (Leidy).

A number of minor difficulties were encountered in the identification of some type specimens, particularly in the case of the Newberry Collection. Professor Newberry, it appears, did not always designate his type specimen at the time of description, but like some of his contemporaries, sometimes selected a more perfect specimen obtained later and designated it as the type. Thus *Ctenacanthus compressus* was originally described,[1] from the distal half of a spine (Catal. no. 140). This is obviously the type. But the specimen labeled type, in Newberry's hand, is an almost complete specimen, No. 205, evidently the one referred to at page 168 of the 'Paleozoic Fishes of North America' as having been "recently received." In this catalogue the writer has endeavored to put on record a correct interpretation of all such specimens.

In conclusion I wish to acknowledge the constant help derived from Dr. O. P. Hay's 'Bibliography and Catalogue of the Fossil Vertebrata of North America'; and to express my indebtedness to Professor Bashford Dean for much valuable advice given me during the preparation of this catalogue.

---

[1] Annals N. Y. Acad. Sci., I, 1878, p. 191.

CATALOGUE OF TYPES AND FIGURED SPECIMENS.

ANTIARCHA Cope 1885.

BOTHRIOLEPIS LEIDYI Newberry. See *B. nitida* (Leidy).

Bothriolepis nitida (Leidy) 1856.

Figured 3336 Left lateral spine attached to left antero-ventrolateral, in matrix; exhibits under surface. *B. leidyi* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 111, pl. xx, fig. 1. This and the following three specimens are apparently the cotypes of *B. leidyi.*
Catskill: Near Blossburg, Pa. Jas. Hall Coll.

Figured 6047 Block of sandstone containing numerous plates, two of which are figured. *Loc. cit.* figs. 4, 5. . . . . Newb. Coll.
Catskill: Mansfield, Pa.

Figured 6066 Lateral spine in matrix. *Loc. cit.* fig. 2. . . . Newb. Coll.
Catskill: Tioga Co., Pa.

Figured 6067 Head shield, in matrix. *Loc. cit.* fig. 3. . . . . Newb. Coll.
Catskill: Tioga Co., Pa.

Bothriolepis minor Newberry 1889.

Cotype 6561 Slab of rock containing various plates and fragments. *B. minor* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 112, pl. xx, figs. 7, 8? Chemung: Le Roy, Bradford Co., Pa. . Newb. Coll.

Cotype 6571 Dorsomedian element, in matrix. *Loc. cit.* fig. 6. . Newb. Coll.
Chemung: Le Roy, Bradford Co., Pa.

Cotype 6576 Dorsomedian element, in matrix. *Loc. cit.* p. 112, no. fig.
Chemung: Le Roy, Bradford Co., Pa. . . Newb. Coll.

ARTHROGNATHI Dean 1899.

Asterosteus stenocephalus Newberry 1875.

Cotype 314 Median portion of cranial shield, in matrix. *A. stenocephalus* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 36, pl. liv, fig. 1; Paleoz. Fishes N. Amer. 1889, p. 44, pl. xxx, fig. 1. The figure is based on both this and the following specimen. . . . . Newb. Coll.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

Cotype 3483 Median portion of cranial shield. Shows two olfactory (?) openings and both preorbital (?) sensory canals. *Loc. cit.* Newb. Coll.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

Callognathus regularis Newberry 1889.

Type 1079 Small toothed "mandible" in shale. *C. regularis* Newberry, Paleoz. Fishes N. Amer. p. 70, pl. xxvii, fig. 18. . Newb. Coll.
Huron shale (base of Up. Devonian): Delaware, Ohio.

Callognathus serratus Newberry 1889.

Cotype 353 Anterior half of a small right "mandible" in shale. *C. serratus* Newberry, *loc. cit.* p. 70, pl. xxvii, fig. 17. . . Newb. Coll.
Cleveland shale (Up. Devonian): Sheffield Township, Lorain Co., Ohio.

Cotype 2521 Spatular end of a small "mandible" in shale. *Loc. cit.* pl. xxvii, fig. 16. . . . . Newb. Coll.
Cleveland shale: Lorain Co., Ohio.

Coccosteus decipiens Agassiz 1844.

Figured 312 Dorsomedian element, in matrix; dorsal aspect. *C. cuspidatus* Agas., Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 33, pl. liv, fig. 3; *C. decipiens* Agas., Newberry, Paleoz. Fishes N. Amer. p. 52, pl. xxx, fig. 3. . . . . Newb. Coll.
Old Red Sandstone: Gamrie, Scotland.

Figured 7104 Cranial shield and body armor of a single individual in the matrix. Suborbital, "mandible," "premaxillary" and "maxillary" of the left side well shown. *C. decipiens* Agassiz, Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 121, fig. 12.
Old Red Sandstone: Lethen, Scotland.

Coccosteus macromus Cope 1892.

Type 2590 Antero-dorsolateral (?) and several indeterminate fragments on a block of sandstone. *C. macromus* Cope, Proc. Amer. Philos. Soc. XXX, 1892, p. 225 (no. fig.). . . . . Cope Coll.
Chemung: Le Roy, Pa.

Coccosteus occidentalis Newberry 1875.

Type 313 Dorsomedian plate showing dorsal aspect. *C. occidentalis* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, p. 32, pl.

liv, fig. 2 (does not indicate the lateral line); Paleoz. Fishes N. Amer. 1889, p. 52, pl. xxx, fig. 2 (ditto). Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 141, fig. 22 B (outline; shows lateral line). Eastman, N. Y. State Mus. Mem. 10, 1907, p. 115, pl. ix, fig. 3 (from photograph; lateral line well shown). . . . . Newb. Coll.

Delaware limestone (Mid. Devon.): Delaware, Ohio.

Figured 315 Postero-ventromedian showing inner aspect. *C. occidentalis* Newberry, *loc. cit.* 1875, p. 33, fig. 2a; 1889, fig. 2a. Newb. Coll.

Delaware limestone (Mid. Devon.): Delaware, Ohio.

Dinichthys clarki (Claypole) 1892.

Cleveland shale (Up. Devon.): Linndale, Ohio.

Figured 7297 Right "mandible" lacking anterior cutting portion. Type of *D. kepleri* Claypole, Amer. Geologist XIX, 1897, p. 322, pl. xx. As *D. clarki* Claypole, Hussakof, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 413.

Figured 7039 Antero-dorsolateral showing inner aspect. *D. clarki* Clayp., Hussakof, *loc. cit.* pl. xv, fig. 2.

Figured 7038 Right antero-ventrolateral showing inner aspect. *Loc. cit.* p. 414, pl. xvii, fig. 1.

Figured 7041 Right postero-ventrolateral showing inner aspect. *Loc. cit.* p. 414, pl. xvii, fig. 2.

Dinichthys curtus Newberry 1888.[1]

Cleveland shale (Up. Devon.): Cuyahoga Co., Ohio.

Figured 7299 Right "maxillary." As *D. intermedius* Newberry, Paleoz. Fishes N. Amer. 1889, pl. xlvii, figs. 4, 4a. *D. curtus* Newb., Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 112, pl. xii, fig. 2. . . . . Newb. Coll.

Figured 7071 Both halves of a large concretion of shale containing imperfectly preserved remains of head and body armor of a single individual. The various portions have been catalogued under separate numbers as follows:

7071, Impression of left half of the cranial shield. *D. curtus* Newb., Hussakof, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 409, pl. xv, fig. 1.

---

[1] Type in the Geological Museum of the Ohio Wesleyan University, Delaware, Ohio.

7057, Left "premaxillary." *D. curtus* Newb., Hussakof, Mem. Amer. Mus. IX, 1906, p. 112, pl. xii, fig. 1.

7054, 7055, Both "mandibles," the left almost complete, the right lacking the posterior fourth. *Loc. cit.* 1906, p. 112, pl. xii, figs. 3, 4.

7072, Left half of dorsomedian plate, showing inner aspect. *D. curtus* Newb., Hussakof, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 410, text fig. 1.

7048, Left antero-ventrolateral showing inner aspect. *Loc. cit.* p. 411, pl. xvi, fig. 1.

7047, Both postero-ventrolaterals showing inner aspect. Same fragment of matrix contains also a portion of a "clavicle." *Loc. cit.* p. 411, pl. xvi, fig. 2. . . . . Kepler Coll.

Figured 209 Right suborbital showing inner aspect. As *D. intermedius* Newberry, Paleoz. Fishes N. Amer. 1889, pl. xlvii, fig. 1a. Newb. Coll.

Cotype? 227 Left antero-ventrolateral showing external aspect. *D. curtus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 156, pl. l, fig. 2. Newb. Coll.

Figured 5159 Antero-ventrolateral, imperfectly preserved; specific determination somewhat doubtful. *D. curtus* Newberry, *loc. cit.* p. 156, pl. xlviii, fig. 3.

Dinichthys gouldi Newberry 1885. (Fig 1.)

Type 160 Imperfectly preserved cranial shield, dentition and dorsal armoring of a single individual. The various plates in the Newberry Collection have been catalogued under separate numbers as follows:

160, Greater portion of cranial shield showing the pineal, centrals, preorbitals and median occipital elements as well as the postero-lateral region of the right side. The sutures are rather indistinct owing to a deposit of crystals and to fragments of plates adhering to the dorsal surface. The impression of an entire sclerotic ring covers the right side. Of the lateral lines only the left preorbital and a portion of the postorbital are shown. The position of the dorsal opening of the pineal is indicated by a small area of minute tubercles ranged round a circular pore.

161, 164, Indeterminable fragment.

162, 163, Counterpart of cranial shield and sclerotics.
72, Left suborbital, almost perfect.
74, Complete sclerotic ring composed of four separate pieces; in the matrix.
156, Left "premaxillary."
137, Anterior extremity of right "mandible."
63, Posterior half of dorsomedian plate, process not preserved.
64, Left antero-dorsolateral.
165, Right antero-dorsolateral.

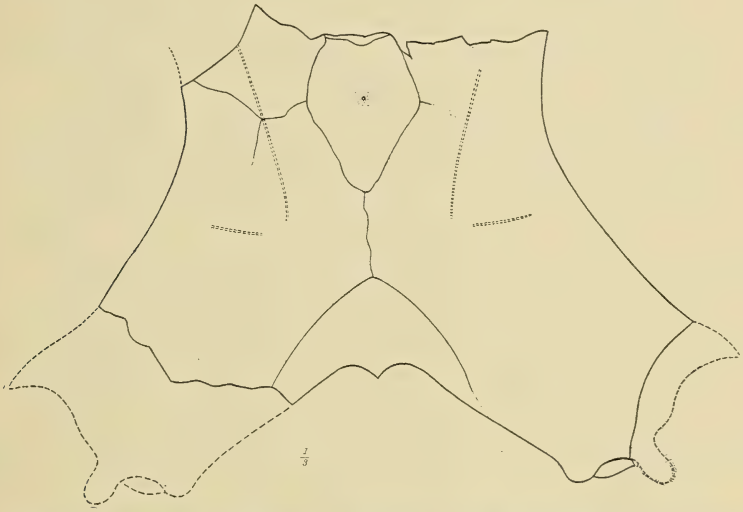

Fig. 1.—*Dinichthys gouldi* Newb. Outline of the type cranial shield showing the sutures and sensory canals as far as determinable No. 160.

Dinichthys gouldii Newberry, Trans. N. Y. Acad. Sci. 1885, p. 26; Paleoz. Fishes N. Amer. p. 150, pl. ix, figs. 1 (sclerotic ring), 2 (left "premaxillary"), 3 (left antero-dorsolateral), 4 (suborbital), 5 (anterior end of right mandible). Newb. Coll.

Cleveland shale (Up. Devon.): Rocky River, near Berea, Ohio.

Figured 2454 Both halves of a concretion about 30 cm. long containing imperfectly preserved remains of the ventral armoring and the notochord. The proportions and direction of the latter are clearly indicated by the series of neural and hæmal arches. Probably *D. gouldi* Newb. Dean, Trans. N. Y. Acad. Sci. XV, 1896, p. 157, pl. vii.

Cleveland shale (Up. Devon.): Near Berea, Ohio.

Dinichthys herzeri Newberry 1868.[1]

Huron shale (Base of Upper Devonian): Delaware, Ohio.

Cotype 81	Large block of shale retaining the cranial shield and dentition, imperfectly preserved, but in almost natural association. *D. herzeri* NEWBERRY, Proc. Amer. A. A. S. 16th meeting, 1868, p. 146 (contains first published restoration of dentition in Dinichthys, p. 147); *D. hertzeri*, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 318. *D. herzeri* Newb., HUSSAKOF, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 109, text fig. 3 (sketch of arrangement of dental elements in this specimen) and p. 118, fig. 11 (anterior extremity of right "mandible," inner aspect, showing row of symphyseal denticles). . . . Newb. Coll.
Cotype 7300	Almost perfect left "mandible." *D. herzeri* NEWBERRY, Proc. Amer. A. A. S. 1868, p. 146, text figure; Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 318, pl. xxx, figs. 1, 2. HUSSAKOF, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 118, pl. xiii, fig. 1. Newb. Coll.
Figured 34	Left "premaxillary" showing a row of denticles on anterior face. *D. herzeri* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 316, pl. xxxi, figs. 1, 2; Paleoz. Fishes N. Amer. 1889, p. 64, pl. xxxii, fig. 2. HUSSAKOF, Mem. Amer. Mus. Nat. Hist. IX, 1906, pl. xiii, fig. 2. . . . . . . Newb. Coll.
Figured 33	Incomplete "maxillary" showing roots of "teeth." *D. herzeri* Newb. HUSSAKOF, *loc. cit.* pl. xiii, fig. 3. . . . Newb. Coll.

Dinichthys intermedius Newberry 1889.

Cleveland shale (Up. Devonian).
Lorain and Cuyahoga Cos., Ohio.

Cotype 238	Anterior half of cranial shield, well preserved. *D. intermedius* NEWBERRY, Paleoz. Fishes N. Amer. p. 152, pl. li, figs. 2, 3. Newb. Coll.
Cotype 7301	Cranial shield and suborbitals. (At present mounted with other remains in a restoration of the cranial and dorsal armor.) *Loc. cit.* pl. li, fig. 1. . . . . Newb. Coll.

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[1] Prof. Newberry did not specially indicate the types of this species and I have therefore had considerable difficulty in determining them. It appears from his earliest description (1868) that at that time he clearly had in mind two specimens as illustrating particularly well the characters of this species. One of these specimens was the cranial shield and dentition of one individual (No. 81); the other, an almost perfect left mandible of a second individual. I have therefore designated these two specimens as cotypes. *Vide* Newberry, Proc. A. A. A. S. 1868, pp. 146–147.

Cotype 7525	Cranial shield with both antero-dorsolaterals *in situ* imbedded in shale, showing inner aspect. *Loc. cit.* pl. lii, fig. 1.	Newb. Coll.
Cotype 32	Left "maxillary." *Loc. cit.* pl. xlvii, fig. 3.	Newb. Coll.
Cotype 7303	Left "mandible," well preserved, showing vestigial denticles near posterior termination of cutting edge. *Loc. cit.* pl. x, figs. 1, 2.	Newb. Coll.
Figured 183	Almost perfect cranial shield. *Loc. cit.* pl. iv, figs. 1, 2.	Newb. Coll.
Cotype 210	Left antero-ventrolateral showing inner aspect; posterior third wanting. *Loc. cit.* pl. xlvii, fig. 2.	Newb. Coll.
Figured 3513	Spatular portion of right "mandible." *D. intermedius* Newb., Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 113, text fig. 6.	Newb. Coll.
Figured 60	Incomplete and crushed dorsomedian plate bearing tooth-marks inflicted by a contemporary dinichthyid. Hussakof, *loc. cit.* p. 116, text fig. 10.	Newb. Coll.
Figured 84	Left postero-dorsolateral, figured by Newberry as a "jugular plate." Paleoz. Fishes N. Amer. pl. vi, fig. 2a.	Newb. Coll.
Figured 83	Right marginal element of cranial shield. *Loc. cit.* pl. l, fig. 1.	Newb. Coll.
Figured 5	"Clavicular" plate. Newberry, *loc. cit.* pl. xlviii, figs. 1, 2. Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 133, text fig. 19.	Newb. Coll.
Figured 153	Fin-ray (?) 17 cm. long; almost perfect. Newberry, *loc. cit.* pl. v, fig. 4.	Newb. Coll.
Figured 154	Fin-ray (?), 17.5 cm. long; well preserved. *Loc. cit.* pl. v, fig. 5.	Newb. Coll.
Figured 195	Slab of shale with various body plates of a single individual. *D. intermedius,* Newb., Hussakof, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 27, pl. v.	Newb. Coll.
Figured 3539	Anterior half of a left "mandible" showing outer face ornamented by irregularly scattered denticles. *D. intermedius* Newb., Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 115, pl. xiii, fig. 5.	

DINICHTHYS KEPLERI Claypole. See *D. clarki* (Claypole).

Dinichthys minor Newberry 1878.

Type 118 Median occipital element of cranial shield, a small right "mandible" and an incomplete dorsomedian plate, apparently all belonging to one individual. Of these the "mandible" has received the separate number, 5045, and the dorsomedian, of which only the distal end is preserved in the Newberry Collection, has been catalogued as No. 54. *D. minor* Newberry, Annals N. Y. Acad. Sci. I, 1878, p. 191; Paleoz. Fishes N. Amer. 1889, p. 149, pl. viii, figs. 3–5. . . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Sheffield, Ohio.

Dinichthys precursor Newberry 1889.

Type 5292 Impression in limestone of the inner face of greater portion of a dorsomedian plate. *D. precursor* Newberry, Paleoz. Fishes N. Amer. p. 51, pl. xli. . . . . Newb. Coll.
Columbus limestone (Base of Mesodev.). Sylvania, Ohio.

Dinichthys terrelli Newberry 1873.

Cleveland shale (Up. Devonian). Lorain Co., Ohio.

Cotype[1] 86 Right external occipital element. *D. hertzeri* Newberry, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 317, pl. xxxiv, fig. 4; also p. 322, where *D. terrelli* n. sp. is proposed. *D. terrelli* Newberry, *Ibid.* II, 1875, p. 27. . . . . . Newb. Coll.

Cotype 2233 Left external occipital element. *Loc. cit.* 1873, pl. xxxiv, figs. 3, 3a, 3b (as *D. hertzeri*); also 1875, p. 27 (*D. terrelli*). Newb. Coll.

Cotype 48 Right antero-dorsolateral. *Loc. cit.* 1873, p. 316, pl. xxxiv, figs. 2, 2a (as *D. hertzeri*); 1875, p. 27 (*D. terrelli*). Newb. Coll.

Cotype 68 Left antero-dorsolateral. *Loc. cit.* 1873, p. 316, pl. xxxiv, figs. 1, 1a (as *D. hertzeri*); 1875, p. 27 (*D. terrelli*). . Newb. Coll.

Figured 100 "Olfactory capsule" (Dean). *D. terrelli* Newberry, Paleoz. Fishes N. Amer. 1889, pl. vii, fig. 2. . . . . Newb. Coll.

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[1] Of the six cotypes, two were destroyed by fire in 1872 (Newberry, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 321 footnote. *Vide* Ibid. plate 32, dorsomedian; pl. 33, cranial shield).

It does not appear from the records whether the four cotypes enumerated above are parts of one individual or not, and since they have been catalogued under separate numbers I have deemed it advisable to retain them so. The two external occipitals appear to belong to one individual, as do also the two antero-dorsolaterals.

Figured 102 Ditto. pl. vii, fig. 2a. . . . . Newb. Coll.

Figured 5190 Median occipital element of cranial shield. *D. terrelli* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 28, pl. lix, fig. 8. . . . . Newb. Coll.

Figured 146 Incomplete pineal plate, showing fontanelle. *D. terrelli* Newberry, Paleoz. Fishes N. Amer. 1889, pl. xliii, fig. 2. Newb. Coll.

Figured 7298 Right suborbital (figured as a ventral plate). *D. terrelli* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, Chart 6, fig. C′. . . . . Newb. Coll.

Figured 7306 Left suborbital (figured as a ventral plate). *Loc. cit.* Chart 6, fig. C. . . . . Newb. Coll.

Figured 7307 Left "premaxillary." *Loc. cit.* Chart 5, figs. 1, 2. Newb. Coll.

Figured 26 Left "maxillary"; excellent specimen. *Loc. cit.* Chart 5, figs. 3, 4. . . . . Newb. Coll.

Figured 15 Left "mandible"; fine perfect specimen. *Loc. cit.* Chart 5, fig. 6. . . . . Newb. Coll.

Figured 7308 Dorsomedian plate; fine specimen. *Loc. cit.* Chart 5, fig. 5. Newb. Coll.

Figured 108 Anterior third of a right "mandible" belonging to a very old and large individual: "a fragment broken off by violence and found buried in the soft carbonaceous mud which once formed the sea-bottom, and is now the Cleveland shale." *D. terrelli* Newberry, Paleoz. Fishes N. Amer. p. 296, pl. xxxiii. Newb. Coll.

Figured 7309 Median ventral plate, anterior and posterior moieties fused. *D. terrelli* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, chart 6, fig. A. Dean, Trans. N. Y. Acad. Sci. XVI, 1897, p. 59, pl. iii. . . . . Newb. Coll.

Figured 176 Left antero-ventrolateral plate. Newberry, 1875, *loc. cit.* Chart 6, fig. B. . . . . Newb. Coll.

Figured 7310 Right antero-ventrolateral. *Loc. cit.* Chart 6, fig. B′. Newb. Coll.

Figured 173a Incomplete "fin-ray," 22 cm. *D. terrelli* Newberry, Paleoz. Fishes N. Amer. 1889, p. 240, pl. v, fig. 1. . . . . Newb. Coll.

Figured 174 Almost perfect "fin-ray," 25.5 cm. *Loc. cit.* pl. v, fig. 2. Newb. Coll.

Dinichthys tuberculatus Newberry 1888.

Type 6810 Impression in sandstone of right antero-dorsolateral. *D. tuberculatus* NEWBERRY, Trans. N. Y. Acad. Sci. VII, 1888, p. 179; Paleoz. Fishes N. Amer. 1889, p. 98, pl. xxxii, fig. 3. The figure is based on a plaster cast taken from this impression separately catalogued as No. 6800. . . . . . . Newb. Coll.
Chemung: Warren, Pa.

Dinichthys sp.?

Figured 170 Left "premaxillary" of a young individual. *D. sp.?* NEWBERRY, 1889, p. 268, pl. xix, figs. 10, 10a, 10b. . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Lorain Co., Ohio.

Figured 112 Small "premaxillary" bearing on front face three "ornamental" denticles. Labeled by Newberry *Dinichthys corrugatus. Loc. cit.* 1889, p. 150, pl. viii, figs. 7, 8. . . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Lorain Co., Ohio.

Figured 69 Right antero-dorsolateral of a small dinichthyid. *D. minor* (?) Newb., HUSSAKOF, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 130, text fig. 13 A. . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Lorain Co., Ohio.

Dinomylostoma beecheri Eastman 1906.

Cast[1] 7396 A pair of mandibles and two pairs of upper dental plates. Cast of type specimen. *D. beecheri* EASTMAN, Amer. Journ. Sci. XXI, 1906, p. 137, fig. 2 (mandibles only); Bull. Mus. Comp. Zool. L, 1906, p. 23, pl. i, figs. 4, 5 ("vomerine teeth"), pl. ii, figs. 16, 17 (upper crushing elements), and pls. iv and v. N. Y. State Mus. Mem. 10, 1907, pl. xiv, figs. 5, 6 and pl. xv.
Portage beds: Mount Morris, N. Y.

Diplognathus mirabilis Newberry 1878.

Cleveland shale (Up. Devonian): Lorain Co., Ohio.

Type 12 Anterior half of right "mandible." *D. mirabilis* NEWBERRY, Annals N. Y. Acad. Sci. I, 1878, p. 188; Paleoz. Fishes N. Amer. 1889, p. 160, pl. xii, figs. 1–3. . . . . Newb. Coll.

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[1] Original in Peabody Museum, New Haven, Conn.

Figured 7304 Right "mandible" lacking posterior fourth. *D. mirabilis* Newb., Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 149, text fig. 25 B (showing symphyseal "teeth"). Terrell Coll.

Figured 13 Complete right "mandible." *D. mirabilis* Newberry, Paleoz. Fishes N. Amer. 1889, p. 159, pl. xi, figs. 1–3. . . Newb. Coll.

Figured 14 Complete left "mandible." *Loc. cit.* pl. xi, fig. 4. . Newb. Coll.

Glyptaspis abbreviata Eastman 1907.

Cast[1] 7545 Right antero-ventrolateral plate. Cast of type specimen. *G. abbreviata* Eastman, N. Y. State Mus. Mem. 10, 1907, p. 147, pl. xiii.

Portage beds: Valois (North Hector), N. Y.

Glyptaspis verrucosa Newberry 1889.

Cleveland shale (Up. Devon.): Lorain Co., Ohio.

Cotype 93 Ventral plate. *G. verrucosus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 158, pl. xiii, fig. 2. . . . . . . Newb. Coll.

Cotype 94 Postero-ventromedian. *Loc. cit.* pl. xiii, fig. 1. . . Newb. Coll.

Cotype 92 Portion of a ventral plate; *loc. cit.* p. 158. . . . . Newb. Coll.

Cotype 95 Portion of a ventral plate; *loc. cit.* p. 158. . . . . Newb. Coll.

Liognathus spatulatus Newberry 1873.

Type 325 Right "mandible" showing inner aspect. *L. spatulatus* Newberry, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 306, pl. xxix, fig. 4; Paleoz. Fishes N. Amer. 1889, p. 52, pl. xxx, fig. 5. Hussakof, Mem. Amer. Mus. Nat. Hist. IX, 1906, p. 140, fig. 21 B. . . . . Newb. Coll.

Delaware limestone (Mid. Devon.): Delaware, Ohio.

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[1] Original in N. Y. State Museum, Albany, N. Y.

MACROPETALICHTHYS SULLIVANTI (Newberry).[1] See *M. rapheidolabis* Norwood and Owen.

Macropetalichthys rapheidolabis Norwood and Owen 1846.

Figured 277 Left half of a cranial shield in limestone. *M. sullivanti* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 294, pl. xxv, figs. 1, 1a; Paleoz. Fishes N. Amer. 1889, p. 27, pl. xxxviii, figs. 2, 2a. . . . . Newb. Coll.
Delaware limestone (Mid Devon.): Delaware? Ohio.

Figured 3462 Fragment exhibiting the orbit and the plates surrounding it, seen from the cerebral aspect. *M. sullivanti* Newb., EASTMAN, Amer. Naturalist, XXI, 1897, pl. xii, fig. 1; *M. rapheidolabis* Norwood and Owen, EASTMAN, N. Y. State Mus. Mem. 10, 1907, p. 107, fig. 20.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

Figured 269 Four disarticulated head plates belonging to a single individual; in limestone. *M. rapheidolabis* N. and O., EASTMAN, N. Y. State Mus. Mem. 10, 1907, p. 103, pl. ix, fig. 5. . Newb. Coll.
Delaware limestone (?): Sandusky, Ohio.

Mylostoma newberryi Eastman 1906.

Cast[2] 7548 Anterior extremities of a pair of small "mandibles." *M. variabilis* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 165, pl. xvi, fig. 4. *M. newberryi* EASTMAN, Bull. Mus. Comp. Zool. L, 1907, p. 224, fig. D (part).
Cleveland shale (Up. Devonian): Lorain Co., Ohio.

MYLOSTOMA TERRELLI Newberry. See *M. variabile* Newberry, No. 41.

Mylostoma variabile Newberry 1883.

Cleveland shale (Up. Devonian): Lorain Co., Ohio.

Figured 43 Upper crushing dental plate of a young individual. *M. variabilis* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 165, pl. xiii, fig. 4. *M. variabile* Newb., EASTMAN, Bull. Mus. Comp. Zool. L, 1906, p. 23, pl. i, fig. 1. . . . . Newb. Coll.

Figured 42 Upper dental plate. NEWBERRY, *loc. cit.* pl. xiii, fig. 3; EASTMAN, *loc. cit.* pl. i, fig. 3. . . . . Newb. Coll.

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[1] An interesting history of the type specimen, which was destroyed by fire in 1891, is given by Eastman in N. Y. State Mus. Mem. 10, 1907, p. 100.

[2] Original in Museum of Oberlin College, Oberlin, Ohio.

Figured 7526 Slab of shale containing cranial shield, body armoring and dentition of a single individual. The counterpart slab is in the Museum of Comparative Zoology, Cambridge, Mass. *M. variabilis* Newb., Dean, Mem. N. Y. Acad. Sci. II, 1901, p. 101, pls. vii, viii, and text figs. 7–10; Eastman, Bull. Mus. Comp. Zool. L, 1906, p. 21, pl. i, fig. 6.

Figured 3591 Upper dental plate. Eastman, *loc. cit.* p. 23, pl. i, fig. 8. Newb. Coll.

Figured 44 Incomplete dental plate. Eastman, *loc. cit.* pl. ii, fig. 10. Newb. Coll.

Figured 3590 Upper dental plate. *Loc. cit.* pl. ii, fig. 12. . . . Newb. Coll.

Cast 41 Anterior half of a left "mandible" of an old individual; oral surface much worn by use. Cast of type of *M. terrelli* Newberry, Trans. N. Y. Acad. Sci. II, 1883, p. 147. *M. terrelli* Newberry, Paleoz. Fishes N. Amer. 1889, p. 164, pl. xiv, figs. 1, 2. *M. terrelli* Newb., Eastman, Bull. Mus. Comp. Zool. L, 1906, pl. iii, fig. 21. . . . . Newb. Coll.

Selenosteus kepleri Dean 1901.

Type 7312 Concretion of shale containing a large part of cranial shield and many of the body plates of one individual. *S. kepleri* Dean, Mem. N. Y. Acad. Sci. II, 1901, p. 94, pls. v, vi and text fig. 2.

Cleveland shale (Up. Devon.): Near Cleveland, Ohio.

Stenognathus corrugatus Newberry 1889.

Type 138 Anterior half of a slender "mandible." *Dinichthys corrugatus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 151, pl. vii, figs. 3, 3a. *Stenognathus corrugatus* Newberry, Trans. N. Y. Acad. Sci. XVI, 1897, p. 303. . . . . Newb. Coll.

Cleveland shale (Up. Devonian): Sheffield Township, Lorain Co., Ohio.

Figured 139 Anterior half of a slender mandible. *Stenognathus corrugatus* Newberry, Trans. N. Y. Acad. Sci. XVI, 1897, p. 303, pl. xxiv, figs. 27, 28. . . . . Newb. Coll.

Cleveland shale (Up. Devon.): Lorain Co., Ohio.

Stenosteus glaber Dean 1901.

Type 7313 Slab of shale containing portions of the cranial shield and the body armoring of a single individual. *S. glaber* DEAN, Mem. N. Y. Acad. Sci. II, 1901, p. 89, pls. iii and iv.

Titanichthys agassizi Newberry 1885.[1] (Fig. 2.)

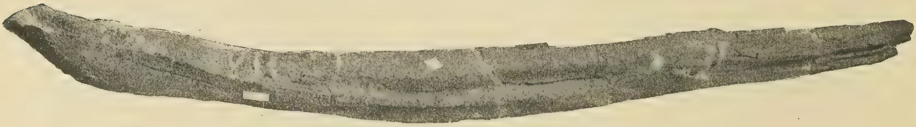

Fig. 2.— *Titanichthys agassizi* Newb. Left mandible, × 1/6. No. 17.

Figured 17 An almost complete left "mandible." *T. agassizii* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 133, pl. ii, figs. 1, 2. Newb. Coll.

Cleveland shale: Lorain Co., Ohio.

Titanichthys clarki Newberry 1887.

Cleveland shale (Up. Devonian): Rocky River, near Berea, Ohio.

Cotype 7315a Large cranial shield lacking the rostral and the left posterolateral portion. Labeled by Newberry "Head of the first Titan." This specimen has been restored, the left external occipital and marginal being replaced by plates of another individual of similar size, and it now forms part of a slab restoration consisting of the cranial shield (7315a), dorsal armor and jaws. *T. clarkii* NEWBERRY, Trans. N. Y. Acad. Sci. VI, 1887, p. 6. . . . . Newb. Coll.

Cotype 7315b Dorsomedian plate mounted in a slab restoration. (See preceding.)

T. clarkii NEWBERRY, *loc. cit.* p. 7; Paleoz. Fishes N. Amer. p. 135, pl. iii, fig. 1, where it is described and figured as a *ventral?* plate. EASTMAN, Amer. Naturalist XXXII, 1898, p. 766, fig. 5, correctly identified it as a dorsomedian plate. (Fig. 3.) Newb. Coll.

Cotype? 7315c Left suborbital belonging to a different individual than either of the two preceding specimens but apparently the plate figured in Paleoz. Fishes pl. iii, fig. 2.

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[1] Type in Museum of Comparative Zoology, Cambridge, Mass.

Cotype 2 Fine complete left "mandible," mounted in same slab with Nos. 7315a and b. *T. clarkii* NEWBERRY 1887, *loc. cit.* p. 7; 1889 *loc. cit.* p. 134, pl. ii, figs. 3, 4. . . . . . . Newb. Coll.

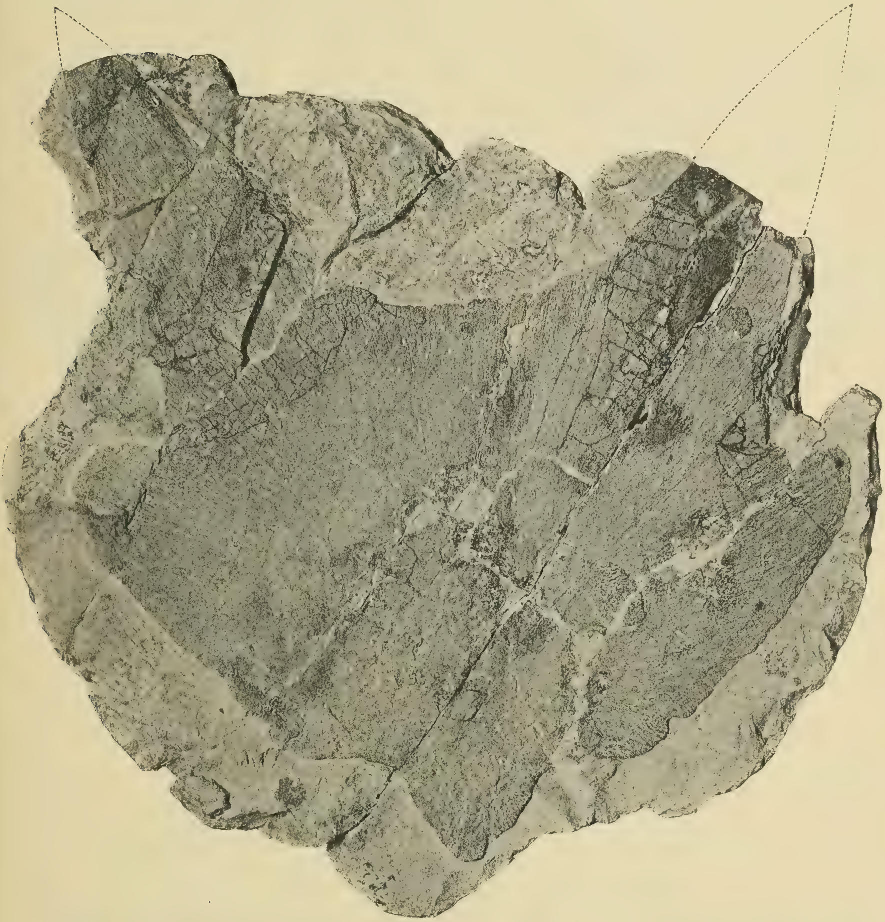

Fig. 3.— *Titanichthys clarki* Newb. Dorsomedian plate, × $\frac{1}{7}$. Cotype? No. 7315 b.

Cotype? 199 Well-preserved "clavicular" partly in shale. Labeled *Type,* by Newberry, but not figured. . . . . Newb. Coll. (Fig. 4.)

Figured 197 Large part of a "clavicular," figured as *coracoid?* NEWBERRY, Paleoz. Fishes, 1889, p. 134, pl. iii, fig. 3. . . . . Newb. Coll.

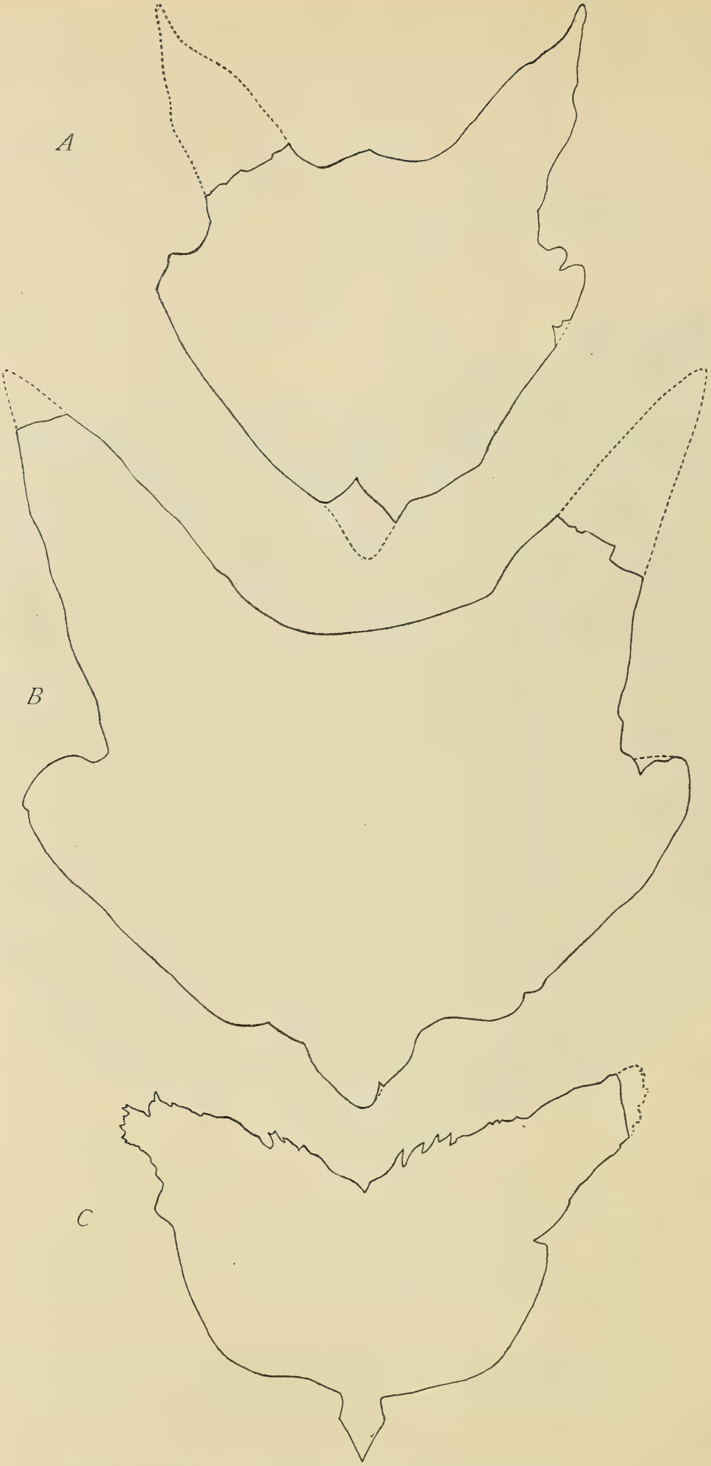

Fig. 5.— Outlines of Dorsomedian Plates of *Titanichthys*. × $\frac{1}{8}$.
A, *T. agassizi* Newb. No. 7590.
B, *T. clarki* Newb. No. 7315b (From same specimen as Fig. 3).
C, *T. n. sp.?* No. 7480.

Figured 91 Postero-dorsolateral plate figured by Newberry as *Hyoid?* of *Dinichthys terrelli*, Paleoz. Fishes, 1889, pl. v, fig. 3. Newb. Coll.
Cleveland shale: Sheffield Township, Lorain Co., Ohio.

Trachosteus clarki Newberry 1889.

Type 104 Slab of shale with various body and dental plates of a single individual. The plates are ornamented with rather large stellate tubercles. One complete sclerotic ring is preserved. *T. clarkii* Newberry, Paleozoic Fishes, 1889, p. 167, pl. xlii, figs. 1–7. . . . . Newb. Coll.
Cleveland shale: Near Berea, Ohio.

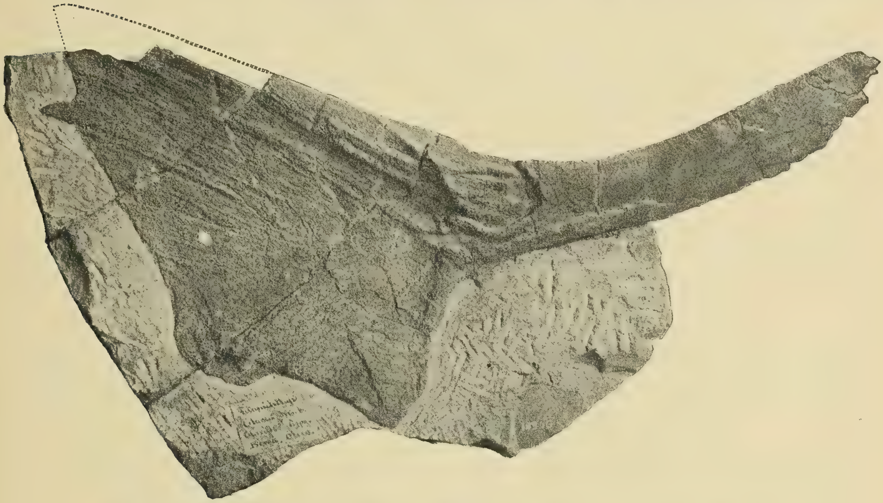

Fig. 4.—*Titanichthys clarki* Newb. "Clavicular," × $\frac{1}{6}$ Cotype? No. 199.

Sp. indet.

Figured 3596 Small element figured as "?Vomerine tooth of a small undetermined Coccostean, possibly of *Dinichthys*." Eastman, Bull. Mus. Comp. Zool. L, 1906, pl. ii, fig. 18.
Cleveland shale: Lorain Co., Ohio.

INCERTÆ SEDIS.

The species following are known only from single or imperfectly preserved body plates whose status is rather doubtful.

Acanthaspis armata Newberry 1875.

Delaware limestone (Mid. Devon.): Sandusky, Ohio.

Cotype 305 Plate with spine attached showing external, denticled surface. *Acanthaspis armatus* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 37, pl. lv, fig. 3; Paleoz. Fishes N. Amer. p. 36, pl. xxxi, fig. 3. . . . . Newb. Coll.

Cotype 4753 Plate without spine, external aspect. *Loc. cit.* 1875, pl. lv, fig. 5. Newb. Coll.

Cotype 4783 Inner aspect of plate without spine. *Loc. cit.* 1875, pl. lv, fig. 6. Newb. Coll.

ACANTHOLEPIS PUSTULOSUS Newberry. See *Eczematolepis fragilis* (Newberry).

Aspidichthys clavatus Newberry 1873.

Type 96 A large incomplete armor plate, 42 cm. by 32 cm., regarded by Newberry as a dorsomedian. It is ornamented on the external surface with large tubercles which are sometimes confluent. *A. clavatus* NEWBERRY, Rept. Geol. Surv. Ohio. I, 1873, p. 323, pl. xxxv, figs. 1, 2; Paleoz. Fishes N. Amer. 1889, p. 73, pl. xxxviii, figs. 3, 4. . . . . Newb. Coll.

Huron shale (Base of Up. Devonian): Delaware, Ohio.

Eczematolepis fragilis (Newberry) 1857.[1]

Figured 271 Two plates suturally united, one tapering laterally to a spine, showing external surface. This specimen as well as the three following ones are cotypes of *Acantholepis pustulosus* NEWBERRY. Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 38, pl. lvi, fig. 1; Paleozoic Fishes N. Amer. 1889, p. 33, pl. xxxi, fig. 5. HAY, Bibliogr. and Catal. Fos. Vert. 1902, p. 332. Newb. Coll.

Delaware limestone (Mid. Devonian): Sandusky, Ohio.

Figured 306 Sub-elliptical plate, somewhat pointed at one end. *Loc. cit.* 1875, pl. lvi, fig. 2. . . . . Newb. Coll.

Delaware limestone: Delaware, Ohio.

Figured 308 "Triangular plate, probably one side of a flattened spine" (Newberry). *Loc. cit.* pl. lvi, fig. 4. . . . . Newb. Coll.

Delaware limestone: Delaware, Ohio.

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[1] For full synonymy of this species see O. P. Hay, Bibliogr. and Catal. Fos. Vert. N. Amer., 1902, p. 332.

Figured Triangular plate, probably a lateral spine. *Loc. cit.* pl. lvi, fig. 6.
4745 Delaware limestone: Delaware, Ohio.

Holonema horridum Cope 1892.

Type Plate exhibiting surface ornamentation; in matrix. *H. horridum*
2591 Cope, Proc. Amer. Philos. Soc. XXX, 1892, p. 222, pl. vii, fig. 1.
Chemung: Bradford Co., Pa.

Holonema rugosum (Claypole) 1883.

Cast Ventromedian plate. Cast of type specimen which was an
5970 impression in sandstone. This is apparently the cast referred
to, and figured by, Claypole. *Pterichthys? rugosus* Claypole,
Proc. Amer. Philos. Soc. XX, 1883, p. 664, fig. 1. *Holonema*
rugosa Clayp. Newberry, Paleoz. Fishes N. Amer. 1889,
p. 93, pl. xvii, fig. 2. . . . . Newb. Coll.
Upper Chemung: Pennsylvania.

Figured Good plate, postero-ventrolateral? *Holonema rugosa* Clayp.
3440 Newberry, *loc. cit.* 1889, p. 94, pl. xvii, fig. 1.
Chemung: Laurenceville, Tioga Co., Pa.

Figured Impression in sandstone of a small plate. *Loc. cit.* pl. xvii, fig.
6567 4. Newb. Coll.
Chemung: Franklin, Delaware Co., N. Y.

Figured Impression in sandstone of a fragmentary plate. Only about
6563 half the figured specimen now preserved. *Loc. cit.* pl. xvii,
fig. 3. . . . . Newb. Coll.
Chemung: Le Roy, Bradford Co., Pa.

Oëstophorus lilleyi (Newberry) 1889.

Type Impression of an indeterminable plate bearing arrow-head-like
424 ornamentation. *Sphenophorus lilleyi* Newberry, Paleoz.
Fishes N. Amer. 1889, p. 92, pl. xx, fig. 15. *Oëstophorus*
lilleyi S. A. Miller, First Appendix, 1892 [to N. Amer. Geol.
and Pal.], p. 716 . . . . Newb. Coll.
Chemung: Le Roy, Bradford Co., Pa.

Palæospondylus gunni Traquair 1890.

L. Old Red Sandstone: Achanarras Quarry, Caithness, Scotland.

Figured Well-preserved specimen lacking only caudal fin; shows distinct
7583 ring-vertebræ. *P. gunni* Traq., Dean, Trans. N. Y. Acad.

	Sci. XV, 1896, p. 100, pl. v, fig. B; Mem. N. Y. Acad. Sci. II. 1899, pl. i, fig. 1.
Figured 7584	Large specimen, not well-preserved. Dean, *loc. cit.* 1899, pl. i, fig. 4.
Figured 7585	Head and anterior third of vertebral column. *Loc. cit.* pl. i, fig. 5.
Figured 7586	Medium-sized specimen; shows dorsal aspect of hinder portion of cranium. *Loc. cit.* pl. i, fig. 7.
Figured 7587	"Small specimen: head of relatively large size, showing a rounded anterior margin" — (Dean). *Loc. cit.* pl. i, fig. 8.
Figured 7588	"Larval specimen. Head region imperfectly preserved, but indicating a large proportionate size" — (Dean). *Loc. cit.* pl. i, fig. 9.

Phyllolepis delicatula Newberry 1889.

Type 6807	Impression of a small plate in standstone. Perhaps a cranial plate of a Palæoniscid or Cœlacanth. *P. delicatula* Newberry, Paleoz. Fishes N. Amer. 1889, p. 97, pl. xix, fig. 11. Chemung: Le Roy, Pa.

Pterichthys? rugosus Claypole. See *Holonema rugosum* (Clayp.).

Sphenophorus lilleyi Newberry. See *Oëstophorus lilleyi* (Newb.).

ELASMOBRANCHII Bonaparte 1832.

I. Pleuropterygii Dean 1894.

Cladodus compressus Branson 1908.

Type 7709	Tooth lacking the distal halves of the central and lateral denticles. *C. striatus* Branson, Rept. Dept. Geol. and Nat. Res. Indiana, 1905, p. 1378, pl. xlii, figs. 1–4. *C. compressus* Branson, Science, XXVII, 1908, p. 311. Salem limestone (Subcarbon.): Paynter's Hill, Ind.

Cladodus concinnus Newberry 1875.

Type 1082 Six more or less perfect teeth and several fragments; two are figured. *C. concinnus* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 48, pl. lviii, fig. 8; Paleoz. Fishes N. Amer. 1889, p. 170, pl. xxi, figs. 9, 10 . . . . Newb. Coll.
Cleveland shale (Up. Devonian): Lorain Co., Ohio.

Cladodus fyleri Newberry. See *Cladoselache fyleri* (Newb.).

Cladodus herzeri Newberry 1875.

Type 355 A single tooth, in matrix. *C. hertzeri* Newberry, *loc. cit.* 1875, p. 46, pl. lviii, figs. 5, 5a . . . . Newb. Coll.
Waverly group (Subcarbon.): Berea, Ohio.

Cladodus kepleri Newberry. See *Cladoselache kepleri* (Newb.).

Cladodus mortifer Newb. and Worth. 1866.

Figured 2246 Basal portion of a tooth showing position of central and lateral denticles. *C. mortifer* N. and W., Newberry, Trans. N. Y. Acad. Sci. XVI, 1897, p. 285, pl. xxii, fig. 2a . . Newb. Coll.
Subcarboniferous: Greencastle, Ind.

Cladodus parvulus Newberry 1875.

Type 882 One small tooth. *C. parvulus* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 48, pl. lviii, figs. 9, 9a. Newb. Coll.
Cleveland shale (Up. Devon.): Sheffield Township, Lorain Co., Ohio.

Cladodus prototypus Eastman 1907.

Type 4257 A single tooth. *C. prototypus* Eastman, N. Y. State Mus. Mem. 10, 1907, p. 62, pl. i, fig. 5 . . . . . . James Hall Coll.
Columbus limestone (Mid. Devon.): Columbus, Ohio.

Cladodus romingeri Newberry 1875.

Type 1080 Tooth in a block of sandstone. *C. romingeri* Newberry, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 49; Paleoz. Fishes N. Amer. 1889, p. 177, pl. xxvii, fig. 10 . . . . Newb. Coll.
Waverly group (Subcarbon.): Battle Creek, Mich.

CLADODUS STRIATUS Branson (*non* Agassiz). See *Cladodus compressus* Branson.

Cladodus terrelli Newberry 1889.

Type 481 95 teeth and fragments of teeth of a single fish. *C. terrelli* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 170, pl. xxvii, figs. 5–7 . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Lorain Co., Ohio.

Cladodus tumidus Newberry 1889.

Type 431 One worn tooth. *C. tumidus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 172, pl. xxvii, figs. 8, 9 . . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Sheffield, Lorain Co., Ohio.

Cladoselache fyleri (Newberry) 1889.

Cleveland shale (Up. Devonian): Cuyahoga Co., Ohio.

Type 240 Entire fish lacking only the ventral fins, exhibiting ventral aspect. It shows with diagrammatic clearness the form and position of the horizontal caudal keel; also the lower jaw cartilages, the position of the orbits, and a patch of myocommata in the abdominal region. The form and structure of the pectorals are clearly shown, that of the right side having about 19 primary rays. Measurements:

Total length, from tip of snout to end of caudal fin	58	cm.
Tip of snout to origin of pectorals	12.5	"
Width between bases of pectorals	8.5	"
Length of right pectoral fin (along line of attachment to body	5.7	"
Width of same (extremity restored)	6.7	"
Width of fish across horizontal caudal keels . . .	7.8	"
Length of tail posterior to caudal keel	6.5	"

Cladodus fyleri NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 322, pl. xlvi (no description). The spine-shaped piece marked c in this figure does not belong to the fish but is due to a flexure in the matrix. No fin-spines present in this specimen. Newb. Coll.

Figured 239 Entire fish in shale, of which the posterior portion showing myocommata is figured. *Cladodus fyleri* NEWBERRY, Paleoz. Fishes N. Amer., 1889, p. 328, pl. xlix, fig. 2 . . . . . Newb. Coll.

Figured 229 Ventral fins in shale. *Cladodus fyleri* NEWBERRY, *loc. cit.* pl. xlix, fig. 3. *Cladoselache fyleri* (Newb.), DEAN, Journ. Morph. IX, 1894, pl. vii, fig. 2 . . . . Newb. Coll.

Figured 7527 Entire fish in shale showing heterocercal tail in side view. *Cladoselache fyleri* (Newb.), DEAN, Journ. Morph. IX, 1894, p. 98, pl. vii, fig. 3 (only the heterocercal caudal figured). Newb. Coll.

Cladoselache kepleri (Newberry) 1888.

Type 7316 7317 Anterior half of a well preserved fish in ventral aspect. It shows the anterior outline of head, the jaw cartilages, orbits, pectorals and much of the finer detail. Counterpart present.

Measurements:

Anterior extremity of head to origin of pectorals . .	27	cm.
Width of head across orbits	14	"
Width of fish in front of pectorals	17	"
Length of left pectoral (along line of attachment to body)	14.7	"
Width of pectoral	18.5	"

Cladodus kepleri NEWBERRY, Trans. N. Y. Acad. Sci. VII, 1888, p. 178; Paleoz. Fishes N. Amer. 1888, p. 103, pl. xliv, figs. 1, 2; pl. xlv . . . . Newb. Coll.

Cleveland shale (Up. Devonian): Brooklyn, Cuyahoga Co., Ohio.

Cladoselache newberryi Dean 1893.

Type 7019 Small imperfectly preserved fish (estimated at 42 cm. when complete), in ventral aspect. It lacks the anterior portion of head, the right pectoral and the hinder third of body. Counterpart present. *Cladoselache newberryi* DEAN, Trans. N. Y. Acad. Sci. XIII, 1893, p. 115, pl. i, figs. 3–8.

Cleveland shale (Up. Devonian): Linndale, Ohio.

Cladoselache sp.

Figured 250 Fragment of a fish showing a well-preserved sclerotic ring. *Cladodus kepleri* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 318, pl. xliv, fig. 3. *Cladoselache fyleri* (Newb.), DEAN, Journ. Morph. IX, 1894, p. 105, pl. vii, fig. 6. . Newb. Coll.

Cleveland shale (Up. Devonian): Linndale, Ohio.

Phœbodus politus Newberry 1889.

Type 411 Two teeth. *P. politus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 173, pl. xxvii, figs. 27, 28 . . . . Newb. Coll.
Cleveland shale (Up. Devonian); Lorain Co., Ohio.

II. ICHTHYOTOMI Cope 1884.

DIDYMODUS Cope. See *Pleuracanthus* Agassiz.
DIPLODUS Agassiz. See *Dittodus* Owen.

Dittodus latus (Newberry) 1856.

Cotype 473 One tooth on a tablet of coal. *Diplodus latus* NEWBERRY, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 99; Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 44, pl. lviii, fig. 1a. Newb. Coll.
Coal Measures: Linton, Ohio.

Cotype 476 One tooth on tablet of coal. *Loc. cit.* 1875, pl. lviii, fig. 1.
Coal Measures: Linton, Ohio. Newb. Coll.

Pleuracanthus platypternus (Cope) 1884.

Type 7243 Many fragments of crania and jaws; two fragmentary teeth. *Didymodus platypternus* COPE, Proc. Amer. Philos. Soc. XXI, 1884, p. 587, figs. 8, 9 . . . . Cope Coll.
Permian: Texas.

Pleuracanthus texensis (Cope) 1883.

Type 7117 Facial portion of one skull and roof portions of two others; two teeth. *Didymodus? compressus* COPE, Proc. Acad. Nat. Sci. Phila. 1883, p. 108; *Didymodus compressus* COPE, Amer. Naturalist XVIII, 1884, p. 818, pl. xxiii, figs. 1–6. Cope Coll.
Wichita (Permian): Texas.

III. PLAGIOSTOMI Duméril 1806.

Antliodus arcuatus Newberry 1889.

Type 410 One tooth in the matrix. *A. arcuatus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 208, pl. xix, fig. 3 . . . . Newb. Coll.
St. Louis limestone (Subcarbon.): Greencastle, Ind.

Figured 388 One large tooth in the matrix. *Loc. cit. pl.* xix, fig. 4. Newb. Coll.
St. Louis limestone (Subcarb.): Spencer, Owen Co., Ind.

Archæobatis gigas Newberry 1878.

Type 360 Four large dental plates constituting half of the lower (?) dentition. Associated with these elements are several other less perfect ones belonging apparently to other individuals. *A. gigas* NEWBERRY, Annals N. Y. Acad. Sci. I, 1878, p. 190; Paleoz. Fishes N. Amer. 1889, p. 194, pl. xxii, figs. 1, 2; pl. xxiii, figs. 1, 2 . . . . Newb. Coll.
St. Louis limestone (Subcarb.): Greencastle, Ind.

Cœlosteus ferox Newberry 1887.

Type 106 "Superficially calcified meckelian cartilage of an Elasmobranch." — A. S. Woodward (Cat. Fos. Fishes Brit. Mus. II, 1891, p. 346). *C. ferox* NEWBERRY, Trans. N. Y. Acad. Sci. VI, 1887, p. 137; Paleoz. Fishes N. Amer. 1889, p. 190, pl. xxxv, figs. 1–4. . . . . Newb. Coll.
St. Louis limestone (Subcarbon.): Alton, Ill.

Copodus marginatus (Newberry) 1889.

Type 6425 One dental plate. *Labodus marginatus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 198, pl. xix, fig. 9. *Copodus marginatus* (Newb.), HAY, Bibl. and Catal. Fos. Verteb. N. Amer. 1902, p. 285 . . . . Newb. Coll.
St. Louis limestone (Subcarb.): Greencastle, Ind.

Corax falcatus Agassiz 1843. (Fig. 6.)

1909 Two teeth, the types of *Galeocerdo crassidens* COPE. Proc. Amer. Philos. Soc. XII, 1872, p. 355 . . . . Cope Coll.
Niobrara (Cretac.): Smoky Hill River, Kans.

1908 Four teeth, the types of *Galeocerdo hartwellii* COPE. Proc. Amer. Philos. Soc. XII, 1872, p. 355 . . . Cope Coll.
Niobrara (Cretac.): Smoky Hill River, Kans.

DACTYLODUS Newberry. See *Polyrhizodus* McCoy.

Dasyatis hastata? (DeKay) 1842.

Figured 3095 Fragments of caudal spines one of which is figured. *Pastinaca hastata*? (DeKay), LEIDY in F. S. Holmes, Post-Pleioc. Fos. S. Car. 1860, p. 119, pl. xxvii, fig. 1 (proximal half of a barbed spine).

Post-pliocene. Yonges Island, S. C.

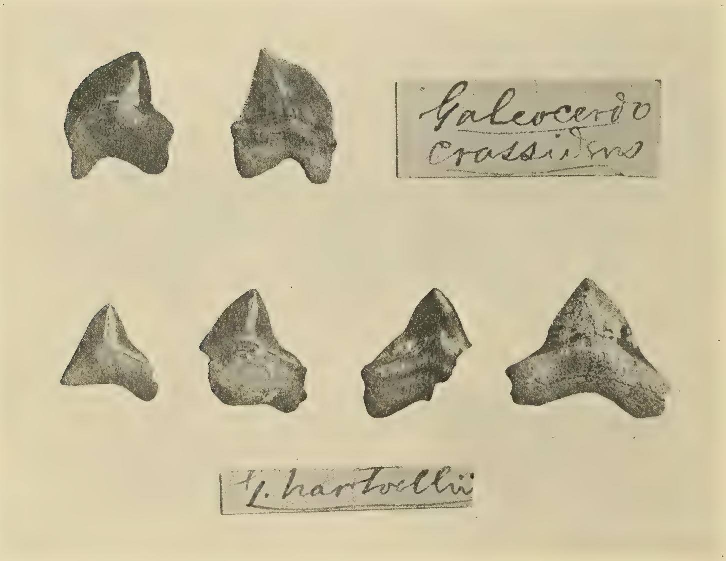

Fig. 6.— *Corax falcatus* Agassiz. Types of Cope's species *Galeocerdo crassidens* and *G. hartwellii*. Natural size. Nos. 1908 and 1909.

Figured 3065 Eight vertebræ two of which are figured. *Loc. cit.* p. 119, pl. xxvii, fig. 2.

Post-pliocene, Yonges Island, S. C.

Deltodus littoni Newb. and Worth, 1870.

Type 385 Imperfect tooth, in limestone. *D. littoni* NEWB. and WORTHEN, Geol. Surv. Ills. IV, 1870, p. 367, pl. iv, figs. 8, 8a. Newb. Coll.

Subcarboniferous: Boone or St. Louis Co., Mo.

Deltodus mercuri Newberry 1876.

Type 462 Imperfect tooth, in limestone. *D. mercurii* NEWBERRY, Rept. Explor. Exped. from Santa Fé, 1876, p. 137, pl. iii, figs. 1, 1a. Newb. Coll.

Coal Measures: Santa Fé, New Mex.

GALEOCERDO CRASSIDENS Cope. See *Corax falcatus* Ag.
" HARTWELLII Cope. " " " "
GONIODUS HERTZERI Newberry. See *Xenodus herzeri* (Newb.).

Hybodus copei Hay 1899.

Type 7295 Fine large spine on block of limestone. *H. regularis* COPE, Proc. U. S. Nat. Mus. XIV, 1891, p. 448, pl. xxviii, fig. 2. *H. copei* HAY, Amer. Nat. XXXIII, 1899, p. 784 . . . Cope Coll.

Triassic? Seymor, Baylor, Co., Tex.

Hybodus fraasi Campbell Brown 1900.

Cast 7191 Fish lacking caudal; lateral aspect. Cast of type. *H. fraasi* BROWN, Palæontogr. XLVI, 1900, p. 151, pl. xv, fig. 1. Original in Palæont. Museum, Munich.

Jurassic (Solnhofen): Bavaria.

HYBODUS REGULARIS Cope. See *H. copei* Hay.
LABODUS MARGINATUS Newberry. See *Copodus marginatus* (Newb.).

Lamna macrorhiza Cope 1875.

Type 2294 Two teeth. *L. macrorhiza* COPE, Vert. Cret. Form. West. 1875, p. 297, pl. xlii, figs. 9, 10 . . . . Cope Coll.

Niobrara (Cretac.): Ellis Co., Tex.

Mazodus kepleri Newberry 1889.

Waverly group (Subcarbon.): Berea, Ohio.

Cotype 134 One large well-preserved dental plate. *M kepleri* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 180, pl. xxi, fig. 2. Newb. Coll.

Cotype 135 A well-preserved dental plate, smaller than preceding. *Loc. cit.* pl. xxi, fig. 1 . . . . Newb. Coll.

Cotype 136 Eight pavement teeth of various sizes belonging to one individual. *Loc. cit.* pl. xxi, fig. 3 . . . . Newb. Coll.

Myledaphus bipartitus Cope 1876. (Fig. 7.)

Type Three small pavement teeth of a batoid shark. *M. bipartitus*
7523 Cope, Proc. Acad. Nat. Sci. Phila. XXVII, p. 260. Cope Coll.

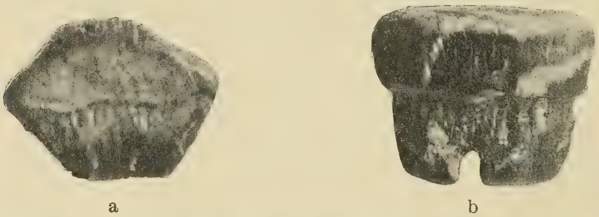

Fig. 7.—*Myledaphus bipartitus* Cope. Two of the three type teeth. × 4, a tooth seen from oral aspect; b, tooth seen from lateral aspect. Type; No. 7523.

Cretaceous: Montana.

Myliobatis fastigiatus Leidy 1877.

Figured Upper dental pavement with 11 median and several small lateral
2245 teeth. *M. fastigiatus* Leidy, Journ. Acad. Nat. Sci. Phila. VIII, 1877, p. 239, pl. xxxi, fig. 11.
Eocene: New Jersey.

Myliobatis glottoides Cope 1870. (Fig. 8.)

Cotype Upper dental pavement with 8 median teeth; the central ones
2820 broken. One of three cotypes. *M. glottoides* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 293. . . . . Cope Coll.
Eocene: Farmingdale, N. J.

Myliobatis rectidens Cope 1870. (Fig. 9.)

Type Series of seven median teeth. *M. rectidens* Cope, Proc. Amer.
2821 Philos. Soc. XI, 1870, p. 294 . . . . Cope Coll.
Miocene? Harrisonville, N. J.

Orodus ramosus Agassiz 1843.

Figured One large tooth, in matrix. *O. ramosus* Agas., Newberry,
529 Paleoz. Fishes N. Amer. 1889, p. 205, pl. xxvii, fig. 29.
Waverly group (Subcarbon.): Grindstone City, Mich.

Otodus sulcatus Geinitz 1843.

Figured 3867 One imperfectly-preserved tooth. *O. sulcatus* Gein., Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 397, pl. xxvi, figs. 3, 4.
Mt. Lebanon Coll.
Upper Cretaceous: Hakel, Mt. Lebanon, Syria.

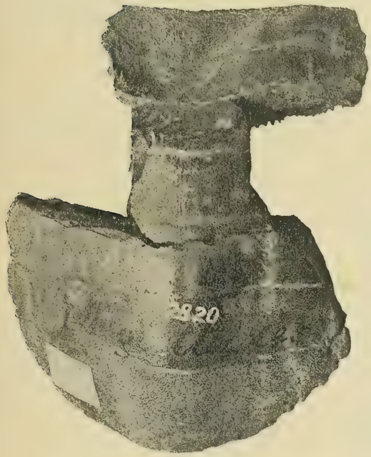

Fig. 8.

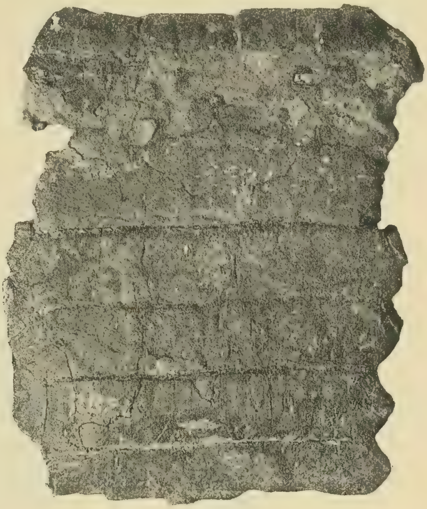

Fig. 9.

Fig. 8.— *Myliobatis glottoides* Cope. Upper dental pavement. × $\frac{3}{4}$. Cotype; No. 2820.
Fig. 9.— *Myliobatis rectidens* Cope. Series of seven median teeth of the lower pavement. × $\frac{3}{4}$. Type; No. 2821.

Pastinaca hastata? (DeKay). See *Dasyatis hastata*? (DeKay).

Platyodus lineatus Newberry 1875.

Type 5290 One large elliptical pavement tooth. *P. lineatus* Newberry, Rept. Geol. Surv. Ohio. Palæont. II, 1875, p. 58, pl. lix, fig. 12.
Newb. Coll.
Waverly group (Subcarbon.): Casey Co., Ky.

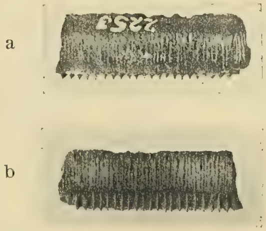

Fig. 10. *Plinthicus stenodon* Cope. Imperfect tooth belonging to the median series of a dental pavement. Natural size. a, upper and b, lower aspects. Type; No. 2253 a.

Plinthicus stenodon Cope 1869. (Fig. 10.)

Type 2253a One median tooth of a dental pavement, incomplete. *P. stenodon* Cope, Proc. Bost. Soc. Nat. Hist. XII, 1869, p. 316.
Miocene: Shiloh, Cumberland Co., N. J. Cope Coll.

Polyrhizodus littoni Newb. and Worthen 1870.

Type One tooth, in limestone. *P. littoni* Newb. and Worthen, Geol.
395 Surv. Ills. IV, 1870, p. 357, pl. iv, figs. 10, 10a . Newb. Coll.
St. Louis limestone (Subcarbon.): St. Louis, Mo.

Figured Tooth, in limestone. *P. littoni* Newb. and Worth. Newberry,
396a Paleoz. Fishes N. Amer. 1889, p. 209, pl. xix, figs. 5, 6.
St. Louis limestone (Subcarbon.): Greencastle, Ind.
Newb. Coll.

Polyrhizodus princeps (Newb. and Worthen) 1866.

Figured Four teeth; two well-preserved (figured), and two defective.
2516 *Dactylodus princeps* Newb. and Worth., Newberry, Trans.
N. Y. Acad. Sci. XVI, 1897, p. 295, pl. xxiii, figs. 5, 6.
St. Louis limestone (Subcarbon.): Alton, Ills. Newb. Coll.

Polyrhizodus rectus (Newberry) 1897.

Type Three teeth, in limestone; two figured. *Dactylodus rectus* Newberry,
2515 Trans. N. Y. Acad. Sci. XVI, 1897, p. 296, pl. xxiii,
figs. 8, 9 . . . . Newb. Coll.
St. Louis limestone (Subcarbon.): Alton, Ills.

Pristis amblodon Cope 1869. (Fig. 11.)

Type Two rostral teeth. *P. amblodon* Cope, Proc. Bost. Soc. Nat.
2829 Hist. XII, 1869, p. 312 . . . . Cope Coll.
Eocene: Farmingdale, N. J.

Pristis attenuatus Cope 1869. (Fig. 12.)

Type One rostral tooth. *P. attenuatus* Cope, Proc. Amer. Philos.
2828 Soc. XI, 1869, p. 244 . . . . Cope Coll.
Tertiary: Flower's marl pit, Duplin Co., N. C.

Psammodus glyptus? St. John and Worthen 1883.

Figured Two dental plates. *P. glyptus* (*?*) St. J. and W., Newberry,
406 Paleoz. Fishes N. Amer. 1889, p. 210, pl. xix, figs. 7, 8.
St. Louis limestone (Subcarbon.): Greencastle, Ind.

Raja whitfieldi Hay 1903.

Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Type 3707 Nearly complete fish. *R. whitfieldi* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 405, pl. xxviii. Mt. Lebanon Coll.

Paratype 3708 Fish lacking head and tail. Hay, *loc. cit.* p. 405.

Paratype 3709 Portion of disk of fish. Hay, *loc. cit.* p. 406.

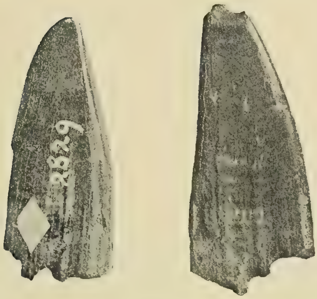

Fig. 11.

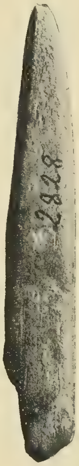

Fig. 12.

Fig. 11.— *Pristis amblodon* Cope. Two rostral teeth; natural size. Type, No. 2829.

Fig. 12.— *Pristis attenuatus* Cope. Rostral tooth; about nat. size. Type, No. 2828.

Rhinobatus eretes Hay 1903.

Type 3715 Portion of a fish, showing part of head and body. *R. eretes* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 404, pl. xxiv, fig. 2. Mt. Lebanon Coll.

Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Rhinobatus bugesiacus (Thiollière) 1849.

Cast 7494 Cast of the very large entire specimen figured by K. A. von Zittel in Handb. Palæont. III, 1887, p. 103, fig. 117 as *Spathobatis mirabilis* Wagner. *Rhinobatus bugesiacus* (Thiollière), A. S. Woodward, Cat. Fos. Fishes Brit. Mus. I, 1889, p. 78, fig. 3. Original in Pal. Mus. Munich.

Lithographic stone: Eichstädt, Bavaria.

Sandalodus crassus Newb. and Worthen 1866.

Figured 390	Six teeth; one figured. *S. crassus* N. and W., NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 204, pl. xxi, fig. 6. Newb. Coll. St. Louis limestone (Subcarbon.): Alton, Ills.
Figured 394	Five teeth, much worn; two figured. *Loc. cit.* pl. xxi, figs. 7, 8. Locality and formation, ditto . . . . Newb. Coll.

Sclerorhynchus hiram Hay 1903.

Type 3705	Head lacking tip of snout. It shows small rostral teeth, mouth, pectoral fins. Counterpart present. *S. hiram* HAY, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 401, pl. xxvi, fig. 1. Mt. Lebanon Coll. Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Sclerorhynchus sentus Hay 1903.

Type 3864	Portion of rostrum showing teeth. *S. sentus* HAY, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 402, pl. xxvii, fig. 1. Mt. Lebanon Coll. Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Sclerorhynchus solomonis Hay 1903.

Type 3706	Head and snout; the latter complete, showing very small rostral teeth. *S. solomonis* HAY, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 399, pl. xxv. . . . . Mt. Lebanon Coll. Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Sclerorhynchus sp. indet.

Figured 3686	Portion of body in side view, showing both dorsals and one ventral. Same block contains also skeletons of *Enchodus* and *Eurypholis.* HAY, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 398, pl. xxiv, fig. 1. . . . . Mt. Lebanon Coll. Upper Cretaceous: Hajula Mt. Lebanon, Syria.

Squatina sp.

Figured 3045	Nine teeth, some of which are figured by LEIDY in F. S. Holmes, Post-Pleioc. Fos. S. Car. 1860, pl. xxvi, figs. 9–16. Eocene? S. Carolina.

Xenodus herzeri (Newberry) 1889.

Type 433 Four small teeth or dermal tubercles. *Goniodus hertzeri* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 69, pl. xxvii, figs. 11–15. *Xenodus hertzeri* (Newb.), S. A. MILLER, First Appendix, 1892, [to N. Amer. Geol. and Pal.], p. 718. Newb. Coll.
Huron shale (Up. Devon.): Delaware, Ohio.

HOLOCEPHALI Bonaparte 1832.

ALETODUS (EGG-CAPSULE). See *Ischyodus* (Egg-capsule).

Bryactinus amorphus Cope 1875. (Fig. 13.)

Type 7197 Imperfectly-preserved small dental plate. *B. amorphus* COPE, Vert. Cret. Form. West 1875, p. 282, pl. xlv, fig. 13.
Cretaceous: New Jersey. Cope Coll.

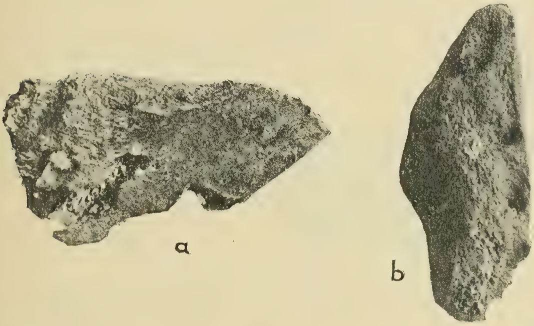

Fig. 13.

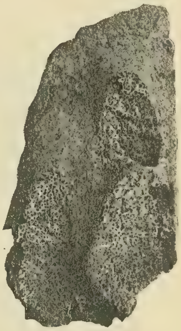

Fig. 14.

Fig. 13.— *Bryactinus amorphus* Cope. Dental plate in outer (a), and upper (b) aspects; about natural size. Type: No. 7197.

Fig. 14.— *Edaphodon eocænus* (Cope). Palatal plate; natural size. Type; No. 7205.

DIPHRISSA LATIDENS Cope. See *Edaphodon latidens* (Cope).
" SOLIDULUS Cope. " " *solidulus* (Cope).

Edaphodon eocænus (Cope) 1875. (Fig. 14.)

Type 7205 One mandibular, one palatal and a fragment. *Ischyodus eocænus* COPE, Cret. Vert. 1875, p. 288 . . . . Cope Coll.
Eocene: Farmingdale, N. J.

Edaphodon fecundus (Cope) 1875. (Pl. I, figs. 1–4.)

Type 2225 Seven mandibular teeth and one palatal. *Ischyodus fecundus* Cope, Cret. Vert. 1875, p. 290 . . . . Cope Coll.
Greensand No. 5 (Cretac.): Hornerstown and Birmingham, N. J.

Edaphodon incrassatus (Cope) 1875. (Pl. I, figs. 5, 6.)

Type 2234 Imperfect right mandibular. *Ischyodus incrassatus* Cope, Cret. Vert. 1875, p. 289 . . . . Cope Coll.
Greensand No. 5 (Cretac.): Hornerstown, N. J.

Edaphodon laterigerus (Cope) 1869. (Pl. I, figs. 7, 8.)

Type 2238 One large left mandibular, almost perfect. *Ischyodus laterigerus* Cope, Proc. Amer. Philos. Soc. XI, 1869, p. 243 Cope Coll.
Greensand No. 5 (Cretac.): Hornerstown, N. J.

Edaphodon latidens (Cope) 1875. (Fig. 15.)

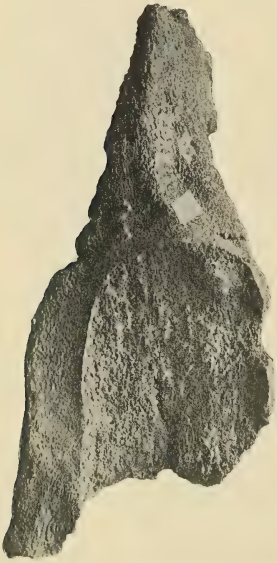

Fig. 15.—*Edaphodon latidens* (Cope). Oral aspect of the type mandibular element; natural size. No. 2232.

Type 2232 An imperfect mandibular. *Diphrissa latidens* Cope, Cret. Vert. 1875, p. 283 . . Cope Coll.
Greensand No. 5 (Cretac.): New Jersey.

Edaphodon mirificus Leidy 1856.

7196 A small left mandibular apparently of a young individual of *E. mirificus* Leidy. By Cope as type of *Ischyodus gaskillii.* Cret. Vert. 1875, p. 290. Cope Coll.
(Pl. II, fig. 3.)
Greensand No. 5 (Cretac.): Birmingham, N. J.

2229 Two mandibular teeth. The right is very incomplete but undoubtedly referable to *E. mirificus* Leidy; the left is more complete but on the whole agrees quite well with *E. mirificus*. By Cope as types of *Ischyodus monolophus*. Proc. Bost. Soc. Nat. Hist. XII, 1869, p. 314. Cope Coll.

Greensand No. 5 (Cretac.): Barnesboro, N. J.

Edaphodon smocki (Cope) 1869. (Pl. II, figs. 4, 5.)

Type 7192 Three mandibular teeth and two fragments. One of the mandibulars, represented only by an anterior extremity, probably not of this species. *Ischyodus smockii* Cope, Proc. Bost. Soc. Nat. Hist. XII, 1869, p. 316 . . . . Cope Coll.

Greensand No. 5 (Cretac.): Hornerstown, N. J.

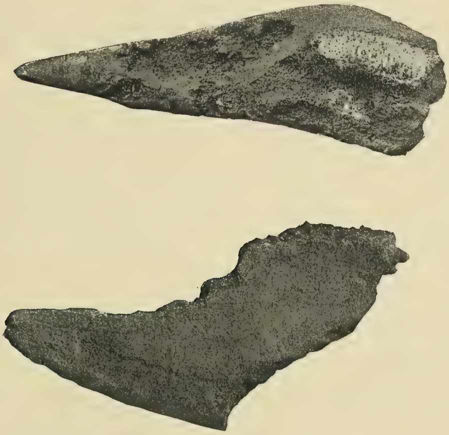

Fig. 16.— Left mandibular element in oral and lateral aspects. × ½. Type of *Edaphodon longirostris* (Cope). No. 2230.

Edaphodon solidulus (Cope) 1869. (Pl. II, figs. 1, 2.)

Type 7193 Left mandibular. *Diphrissa solidulus* Cope, Proc. Amer. Philos. Soc. XI, 1869, p. 244 . . . . Cope Coll.

Greensand No. 5 (Cretac.): Hornerstown, N. J.

Edaphodon stenobryus (Cope) 1875. (Pl. II, figs. 6, 7.)

Type 7204 A pair of mandibulars of one individual. *Ischyodus stenobryus* Cope, Cret. Vert. 1875, p. 285 . . . . Cope Coll.

Greensand No. 5 (Cretac.): Hornerstown, N. J.

Edaphodon tripartitus (Cope) 1875. (Pl. III, figs. 5, 6.)

Type 2224 Both mandibulars and the left palatal of one individual; well preserved. *Ischyodus tripartitus* Cope, Cret. Vert. 1875, p. 286.
Greensand No. 5 (Cretac.): Hurffville, N. J. Cope Coll.

2230 One mandibular and one palatal. By Cope as types of *Ischyodus longirostris*. Cret. Vert. 1875, p. 287. (Fig. 16.) Cope Coll.
Greensand No. 5 (Cretac.): Birmingham, N. J.

Hedronchus sternbergi Cope. See *Scapherpeton* in Section on Amphibia.

Ischyodus eocænus Cope.	See	*Edaphodon*	*eocænus* (Cope).
" fecundus Cope.	"	"	*fecundus* (Cope).
" gaskillii Cope.	"	"	*mirificus* Leidy. (No. 7196)
" incrassatus Cope.	"	"	*incrassatus* (Cope).
" laterigerus Cope.	"	"	*laterigerus* (Cope).
" longirostris Cope.	"	"	*tripartitus* (Cope). (No. 2230)
" monolophus Cope.	"	"	*mirificus* Leidy. (No. 2229)
" smockii Cope.	"	"	*smocki* (Cope).
" stenobryus Cope.	"	"	*stenobryus* (Cope).
" tripartitus Cope.	"	"	*tripartitus* (Cope).

Ischyodus (Aletodus) Egg-capsule.

Cast 7544 Cast of a complete egg-capsule. Original in Kgl. Naturaliencabinet, Stuttgart. *?Ischyodus*, E. Bessels, Jahreshefte Vereins vaterl. Naturkunde Würt. XXV, 1869, p. 152, pl. iii. fig. 1; *Aletodus ferrugineus* Jaekel, Neues Jahrb. Min. Geol, u. Pal. XIV (Beilage-Band), 1901, p. 551, pl. xxii, fig. 3; *Ischyodus* Dean, Chim. Fishes and their Devel. 1906, p. 31, fig. 14.
Dogger β (Jurassic): Heiningen, Württemberg.

Cast 7543 Cast of half a capsule. *Loc. cit.* 1869, pl. iii, fig. 2; 1901, pl. xxiii, fig. 4. Formation and locality as preceding.

Isotænia neocæsariensis Cope 1875. (Pl. III, figs. 3, 4.)

Type An imperfectly preserved palatal tooth. *I. neocæsariensis* Cope,
7208 Cret. Vert. 1875, p. 293 . . . . Cope Coll.
Greensand No. 5 (Cretac.): Hornerstown, N. J.

Leptomylus cooki Cope 1870. (Pl. II, figs. 8, 9.)

Type Right mandibular tooth. *L. cookii* Cope, Proc. Amer. Philos. Soc.
7195 XI, 1870, p. 384. . . . . Cope Coll.
Greensand No. 5 (Cretac.): Near Mt. Holly, N. J.

Leptomylus forfex Cope 1875. (Pl. III, figs. 1, 2.)

Type Right mandibular tooth. *L. forfex* Cope, Cret. Vert. 1875, p. 281.
2233 Cope Coll.
Greensand No. 5 (Cretac.): Hornerstown, N. J.

INCERTÆ SEDIS.

Ptyctodontidæ.[1]

Palæomylus crassus (Newberry) 1873.

Type Left "mandibular tooth" in limestone, showing inner face.
289 *Rhynchodus crassus* Newberry, Rept. Geol. Surv. Ohio,
Palæont. I, 1873, p. 312, pl. xxix, fig. 3; Paleoz. Fishes N.
Amer. 1889, p. 49, pl. xxviii, fig. 4 . . . . Newb. Coll.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

Palæomylus frangens (Newberry) 1873.

Cotype Left "mandibular" showing outer face. *Rhynchodus frangens*
285 Newberry, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 311,
pl. xxviii, figs. 2, 2a; Paleoz. Fishes N. Amer. 1889, p. 48,
pl. xxix, figs. 2, 2a . . . . Newb. Coll.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

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[1] Recent studies on the Ptyctodontidæ make it reasonably certain that these forms belong to the Arthrodira (cf. Louis Dollo, *Les Ptyctodontes sont des Arthrodères*, Bull. Soc. Belge Géol. XXI, 1907, pp. 1–12). But since it is not yet clear that *all* the forms having the ptyctodont dentition are Arthrodires the American species are here provisionally retained as *Incertæ sedis*.

Cotype 286 "Inner face of anterior crown portion of tooth" (Newb.). *Loc. cit.* 1873, p. 311, pl. xxviii, fig. 3; 1889, p. 48, pl. xxix, fig. 3. Newb. Coll.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

Palæomylus greenei (Newberry) 1889.

Type 4594 A large dental plate much broken; some of the fragments lost. *Rhynchodus greenei* NEWBERRY, Paleoz. Fishes N. Amer. 1889; p. 51 (no figure) . . . . Newb. Coll.
Hamilton: Milwaukee, Wis.

RHYNCHODUS CRASSUS Newberry. See *Palæomylus crassus* (Newb.).

Rhynchodus excavatus Newberry 1877.

Figured 1083 Small dental plate, in matrix. Type of *R. occidentalis* NEWBERRY, Annals N. Y. Acad. Sci. I, 1878, p. 192; Paleoz. Fishes N. Amer. 1889, pl. xxix, fig. 1 (figured to illustrate *R. excavatus* Newb.). *R. excavatus* Newb., EASTMAN, N. Y. State Mus. Mem. 10, 1907, p. 68 . . . . Newb. Coll.
Hamilton: Brown Deer, Wis.

RHYNCHODUS FRANGENS Newberry. See *Palæomylus frangens* (Newb.).
" OCCIDENTALIS Newberry. See *R. excavatus* (Newb.).

Rhynchodus secans Newberry 1873.

Delaware limestone (Mid. Devon.): Delaware, Ohio.

Cotype 275 Block of limestone with three dental plates of one individual. *R. secans* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 311, pl. xxix, fig. 2; Paleoz. Fishes N. Amer. 1889, p. 47, pl. xxviii, fig. 3 . . . . Newb. Coll.

Cotype 283 Upper dental plate, lacking tip of "tooth," in matrix. *Loc. cit.* 1873, p. 310, pl. xxix, fig. 1; 1889, pl. xxviii, fig. 2. Newb. Coll.

Cotype 287 Right lower dental plate, showing inner aspect. *Loc. cit.* 1873, pl. xxviii, fig. 1; 1889, pl. xxviii, fig. 1 . . . Newb. Coll.

Rhynchodus sp.

Figured 294 Somewhat quadrangular plate, probably a fragmentary dental element. *Loc. cit.* 1873, p. 310, pl. xxviii, fig. 4. Newb. Coll.
Delaware limestone (Mid. Devon.): Delaware, Ohio.

ICHTHYODORULITES.

Acondylacanthus gracillimus (Newb. and Worth.) 1866.[1]

Figured 363 Entire spine showing both proximal and distal extremities; in limestone. *A. occidentalis* (N. and W.), Newberry, Paleoz. Fishes N. Amer. 1889, p. 206, pl. xxv, fig. 6 . . Newb. Coll.

St. Louis limestone (Subcarbon.): Alton, Ill.

Agassizodus variabilis (Newb. and Worthen). See *Campodus variabilis* (N. and W.) No. 2459.

Asteroptychius elegans Newberry 1889.

Type 420 Spine in matrix. *A. elegans* Newberry, Paleoz. Fishes N. Amer. 1889, p. 176, pl. xxv, fig. 4 . . . Newb. Coll.

Waverly group (Subcarbon.): Grindstone City, Mich.

Asteroptychius gracilis Newberry 1897. (Fig. 17.)

Type 2505 Spine in matrix. *A. gracilis* Newberry, Trans. N. Y. Acad. Sci. XVI, 1897, p. 293 . . . . Newb. Coll.

St. Louis limestone (Subcarbon.): Alton, Ill.

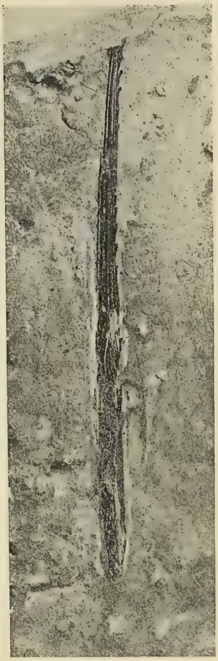

Fig. 17. — *Asteroptychius gracilis* Newb. Type spine; natural size. No. 2505.

Campodus variabilis (Newberry and Worthen) 1870.

Cast 7084 Symphyseal dentition showing eleven fused teeth. Cast of figured specimen. *C. variabilis* (Newb. and Worth.) Eastman, Bull. Mus. Comp. Zool. XXXIX, 1902, p. 57, pl. i. Original in Museum of the State University of Nebraska.

Coal Measures: Cedar Creek, Nebraska.

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[1] For discussion of synonymy see Eastman, Bull. Mus. Compar. Zool. XXXIX, 1902, p. 85. But the present writer deems it advisable to retain the genus *Acondylacanthus*, St. John and Worthen, to differentiate these slender, faintly ornamented spines from *Ctenacanthus*, in accordance with the suggestion made by Newberry in Pal. Ill. II, 1866, p. 116.

Cast 7219 Cast of figured specimen showing symphyseal dentition. *Loc. cit.* pl. ii, and pl. iii, fig. 1. Original in Mus. Compar. Zoology, Cambridge, Mass.

Coal Measures: Osage Co., Kans.

Cast 2459 Cast of figured specimen supposed to be the left half of the lower dentition. *Agassizodus variabilis* (N. and W.), St. John and Worthen, Geol. Surv. Ill. VI, 1875, p. 318, pl. viii, fig. 1. *Campodus variabilis* (N. and W.), Eastman, Bull. Mus. Compar. Zool. XXXIX, 1903, p. 222, pl. i, fig. 1 (part). Original in private collection of O. H. St. John, Raton, New Mex.

Upper Coal Measures: Osage Co., Kans.

Cœlorhynchus[1] acus Cope. See *Cylindracanthus acus* (Cope).

Cylindracanthus acus (Cope) 1870. (Fig. 18.)

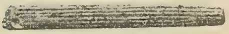

Fig. 18. — *Cylindracanthus acus*, (Cope). Fragment of spine; natural size. Type; No. 2246.

Type 2246 Fragment of a small spine. This is perhaps an immature specimen of *C. ornatus* Leidy. *Cœlorhynchus acus* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 294 . . . . Cope Coll.

Eocene: Farmingdale, N. J.

Ctenacanthus amblyxiphias Cope 1891.

Type 7289 Spine lacking proximal and distal extremities. *C. amblyxiphias* Cope, Proc. U. S. Nat. Mus. XIV, 1891, p. 449, pl. xxviii, fig. 3 . . . . Cope Coll.

Permian: Texas.

Ctenacanthus angustus Newberry 1889. (Fig. 19.)

Type 5296 Fragments of a large spine. *C. angustus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 181 . . . . Newb. Coll.

Berea grit (Subcarbon.): Berea, Ohio.

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[1] *Cœlorhynchus* Agassiz 1843, is preoccupied, the name having been applied to a species of teleost by Giorna in 1803 (Mém. Acad. Sci. Turin, XVI, p. 178 — "*Cœlorhynche la ville*"). The term *Cylindracanthus* may appropriately be substituted, being a name for *Cœlorhynchus* employed by Leidy in 1856 (Proc. Acad. Nat. Sci. Phila. VIII, p. 12). M. Leriche has recently proposed the name *Glyptorhynchus* ("Les Pois, Éoc. du Basin Belge," 1906), but *Cylindracanthus* has priority.

Ctenacanthus clarki Newberry 1889.

Type 220 Well-preserved spine. *C. clarkii* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 168, pl. xxvi, figs. 2, 3 . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Near Berea, Ohio.

Ctenacanthus compressus Newberry 1878.

Type 140 Distal half of a spine. *C. compressus* NEWBERRY, Annals N. Y. Acad. Sci. I, 1878, p. 191; Paleoz. Fishes N. Amer. 1889, p. 168, pl. xxiii, figs. 4–4b . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Sheffield Township, Lorain Co., Ohio.

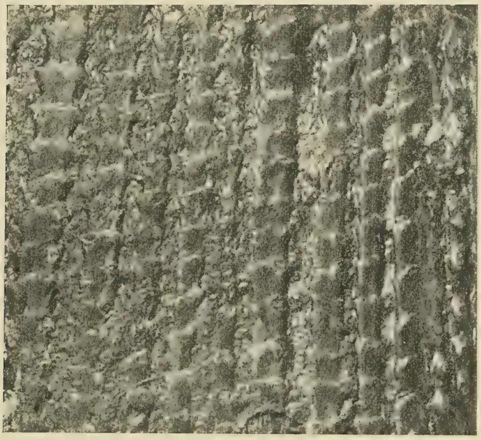

Fig. 19.— *Ctenacanthus angustus* Newb. Surface ornamentation enlarged about five times. From type. No. 5296.

Ctenacanthus cylindricus Newberry 1889.

Type 358 Greater part of a large spine. *C. cylindricus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 202, pl. xxvi, figs. 1–1b. Newb. Coll.
Keokuk (Subcarbon): Casey Co., Ky.

Ctenacanthus littoni Newberry 1889.

Type 1050 Proximal portion of a spine. *C. littoni* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 201, pl. xxv, fig. 3 . . . Newb. Coll.
St. Louis limestone (Subcarbon.): St. Louis, Mo.

CTENACANTHUS PARVULUS Newberry. See *Hoplonchus parvulus* (Newb.).

Ctenacanthus randalli Newberry 1889. (Fig. 20.)

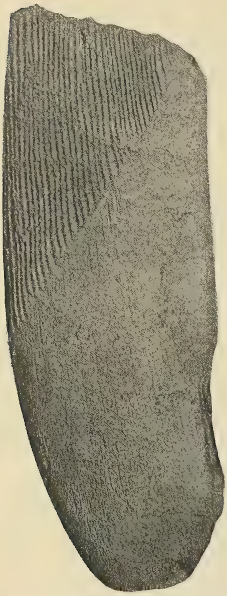

Fig. 20. — *Ctenacanthus randalli* Newb. Photograph from squeeze of type. × ¾. No. 6675.

Type 6675 Impression of proximal portion of a spine of large size. *C. randalli* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 105 . . . Newb. Coll.
Olean Conglomerate (Subcarbon.): Two miles northeast of Warren, Pa.

Ctenacanthus vetustus Newberry 1873.

Type 351 Well-preserved spine, lacking only the distal extremity. *C. vetustus* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 326, pl. xxxv, figs. 3–3d; Paleoz. Fishes N. Amer. 1889, p. 286, pl. xxviii, figs. 5–5d. Newb. Coll.
Cleveland shale (Up. Devon.): Sheffield Township, Lorain Co., Ohio.

Ctenacanthus wrighti Newberry 1884.

Type 352 Spine, slightly crushed. *C. wrightii* NEWBERRY, 35th Ann. Rept. N. Y. State Mus. 1884, p. 206, pl. xvi, fig. 12; Paleoz. Fishes N. Amer. 1889, p. 66, pl. xxvi, figs. 4–4b . Newb. Coll.
Hamilton (Mid. Devon.): Yates Co., N. Y.

Cyrtacanthus dentatus Newberry 1873.

Type 267 Entire spine on block of limestone. *C. dentatus* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 307, pl. xxix, fig. 5. Newb. Coll.
Delaware limestone (Mid. Devon.): Sandusky, Ohio.

Edestus giganteus Newberry 1888.

Type 225 Large fragment bearing five complete teeth, and portion of a sixth. *E. giganteus* NEWBERRY, Annals N. Y. Acad. Sci. IV,

1888, p. 121, pl. vi; Paleoz. Fishes N. Amer. 1889, p. 225, pl. xl . . . . Newb. Coll.
Coal Measures: Decatur, Ill.

Edestus heinrichsi Newb. and Worthen 1870.

Cast 488 Fragment showing a series of seven teeth. Cast of type specimen. *E. heinrichsii* Newb. and Worth., Newberry, Rept. Geol. Surv. Ill. IV, 1870, p. 350, pl. i, fig. 1; *E. heinrichsi,* Paleoz. Fishes N. Amer. 1889, p. 225, pl. xxxix, fig. 2 . Newb. Coll.
Coal Measures: Belleville, Ill.

Figured 466 Segment bearing one tooth. "Young spine" (Newb.). *E. heinrichsi* Newb. and Worth., Newberry, Paleoz. Fishes N. Amer. 1889, p. 225, pl. xxxix, fig. 2a . . . . . Newb. Coll.
Coal Measures: Vermillion Co., Ind.

Figured 465 Segment bearing one tooth. *E. heinrichsi* N. and W., Newberry, Paleoz. Fishes N. Amer. 1889, p. 225, pl. xxxix, fig. 2b.
Coal Measures: Belleville, Ill. Newb. Coll.

Edestus minor Newberry 1866.

Cast 485 Series of seven symphyseal teeth. Cast of the specimen referred to and figured by E. Hitchcock in Proc. Amer. Assoc. Adv. Sci. IX, 1856, p. 229 (no name). *Edestus minor* Newberry, Paleoz. Fishes N. Amer. 1889, pl. xxxix, fig. 1. Original in Museum of Amherst College, Amherst, Mass. . Newb. Coll.
Carboniferous: Park Co., Ind.

Gamphacanthus politus (Newberry) 1889.

Cotype 348 Distal portion of spine, in matrix. *Heteracanthus politus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 66, pl. xxi, figs. 4, 4a; *Gamphacanthus politus* (Newb.), S. A. Miller, First Appendix, 1892, [to N. Amer. Geol. and Pal.] p. 715 . . Newb. Coll.
Hamilton (Mid. Devon.): Milwaukee, Wis.

Cotype 350 Basal portion of spine, in matrix. Newberry, *loc. cit.* pl. xxi, fig. 5. Other references and locality same as preceding.
Newb. Coll.

Gyracanthus alleni Newberry 1873.

Type 403 Spine, lacking distal extremity. *G. alleni* Newberry, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 331, pl. xxxvii, figs. 3–3b . . . . Newb. Coll.
Waverly (Subcarbon.): Medina Co., Ohio.

Gyracanthus compressus Newberry 1873.

Type 386 Three fragments of a large spine. *G. compressus* Newberry, Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 330, pl. xxvii, figs. 1–2b . . . . Newb. Coll.
Waverly (Subcarbon.): Bagdad, Medina Co., Ohio.

Gyracanthus inornatus Newberry 1889.

Type 375 Distal portion of a spine, much worn. *G. inornatus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 177, pl. xxiii, fig. 5.
Waverly (Subcarbon.): Wayne Co., Ohio. Newb. Coll.

Gyracanthus sherwoodi Newberry 1889.

Cotype 5293 Impression in sandstone of portion of an ornamented spine. *G. sherwoodi* Newberry, Paleoz. Fishes N. Amer. 1889, p. 119, pl. xviii, fig. 4a . . . . Newb. Coll.
Catskill: Lamb's Creek, Tioga Co., Pa.

Cotype 334 Several spines in a block of sandstone; one figured. *Loc. cit.* pl. xviii, figs. 4 and 4b. Formation and locality same as preceding . . . . Newb. Coll.

Harpacanthus fimbriatus (Stock) 1883.

Figured 1058 Small spine on block of limestone. *H. fimbriatus* (Stock), Newberry, Paleoz. Fishes N. Amer. 1889, p. 203, pl. xxi, fig. 11.
St. Louis limestone (Subcarbon.): Alton, Ill. Newb. Coll.

Helicoprion bessonowi Karpinsky 1899.

Cast 7212 Symphyseal dentition showing three complete whorls of teeth. Cast of "specimen No. I" of the cotypes. *H. bessonowi* Karpinsky, Verhandl. d. russ.–k. miner. Gesell. St. Petersburg [2], XXXVI, 1899, pp. 361, 392, pl. i.
Artinsk formation (Permo-Carbon): Near Krasnoufimsk, Russia.

Cast 7213 Portion of symphyseal dentition showing one large and one small series of teeth. Cast of one of the cotypes, "specimen No. III." *Loc. cit.* p. 388, fig. 18. Formation and locality same as preceding.

HETERACANTHUS Newberry. See *Gamphacanthus* S. A. Miller.

Hoplonchus parvulus (Newberry) 1875.

Type 7278 7279 Small spine, in shale. Counterpart. *Ctenacanthus parvulus* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 55, pl. lix, fig. 3; *Hoplonchus parvulus*, Paleoz. Fishes N. Amer. 1889, p. 169, pl. xxv, fig. 5 . . . . Newb. Coll.
Cleveland shale (Up. Devon.): Bedford, Ohio.

Lissoprion ferrieri Hay 1907.

Cast 7549 Fragment showing three denticles. Cast of type specimen. *L. ferrieri* HAY, Science, XXVI, 1907, p. 22, text fig.
Perm-Carb. Near Montpelier, Bear Lake Co., Idaho.

Machæracanthus major Newberry 1857.

Type 270 Well-preserved spine on block of limestone. *M. major* NEWBERRY, Proc. Natl. Inst. 1857, p. 125; Rept. Geol. Surv. Ohio, Palæont. I, 1873, p. 304, pl. xxv, fig. 2; Paleoz. Fishes N. Amer. 1889, p. 39, pl. xxix, fig. 4 . . . . . . Newb. Coll.
Delaware limestone (Mid. Devon.): Sandusky, Ohio.

Machæacanthus peracutus Newberry 1857.

Type 272 Well-preserved spine on block of limestone. *M. peracutus* NEWBERRY, Proc. Natl. Inst. 1857, p. 125; Palæont. Ohio I, 1873, p. 305, pl. xxix, fig. 6; Paleoz. Fishes N. Amer. 1889, p. 40, pl. xxix, fig. 6. Newb. Coll.
Delaware limestone (Mid. Devon.): Sandusky, Ohio.

Oracanthus stellatus (Newberry) 1889. (Fig. 21.)

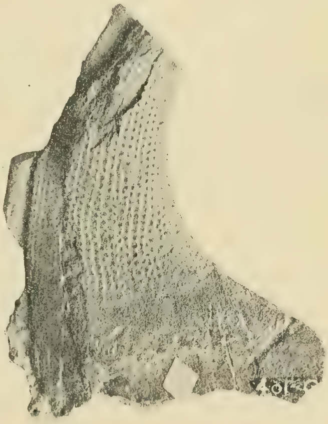

Fig. 21. — *Oracanthus stellatus* (Newb.). Type spine; natural size. No. 401.

Type 401 Small spine ornamented with rows of fine tubercles. *Physonemus stellatus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 200, pl. xxi, fig. 12 . . . . Newb. Coll.
St. Louis limestone (Subcarbon.): Greencastle, Ind.

Petrodus buttersi Newberry 1889.

Type 526 Three dermal tubercles. *P. buttersii* Newb., Paleoz. Fishes, 1889, pl. xxvii, fig. 1. (No description) . . . Newb. Coll.
Coal Meas. Carlinsville, Ill.

Physonemus stellatus Newberry. See *Oracanthus stellatus* (Newb.).

Sphagepœa aciculata Cope 1869. (Fig. 22.)

Type 2235 Portion of a very small spine denticulated along anterior margin; when complete probably only 1½ or 2 cm. long. *S. aciculata* Cope, Proc. Amer. Philos. Soc. XI, 1869, p. 241. Cope Coll.
Cretaceous: Hornerstown, N. J.

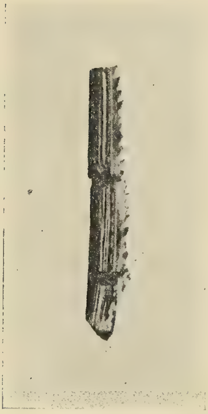

Fig. 22.—*Sphagepœa aciculata* Cope. Type spine. × 4. No. 2235.

Stethacanthus altonensis (St. John and Worthen) 1875.

Figured 416 Large spine. *S. altonensis* (St. J. and W.), Newberry, Paleoz. Fishes N. Amer. 1889, p. 198, pl. xxiv, figs. 1, 2. Newb. Coll.
St. Louis limestone (Subcarbon.): Alton, Ill.

Stethacanthus tumidus Newberry 1889.

Cotype 417 Well-preserved spine. *S. tumidus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 198, pl. xxv, fig. 1 . . . . Newb. Coll.
Cuyahoga shale (Subcarbon): Berea, Ohio.

Cotype 212 Impression of spine with fin (?) attached, in shale. *Loc. cit.* pl. xxv, figs. 2, 2a. Formation and locality same as preceding. Newb. Coll.

DIPNEUSTI Haeckel 1866.

"**Ceratodus eruciferus**" Cope 1876.

Type 7081 Small fragment of a rugose dermal plate described by Cope as a dental element of a dipnoan. *C. eruciferus* Cope, Proc. Acad. Nat. Sci. Phila. 1876, p. 259 . . . . Cope Coll.
Laramie (Cretac.): Montana.

Ceratodus favosus Cope 1884. (Fig. 23.)

Type 7230 Fragmentary dental element, only two ridges preserved. *C. favosus* Cope, Proc. Amer. Philos. Soc. XXII, 1884, p. 28. . . . . Cope Coll.
Permian: Texas.

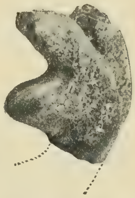

Fig. 23.—*Ceratodus favosus* Cope. Fragmentary dental plate; natural size. Type; No. 7230.

"**Ceratodus hieroglyphus**" Cope 1876.

Type 7080 Fragment of a dermal plate with rugose ornament described by Cope as a dental element of a dipnoan. *C. hieroglyphus* Cope, Proc. Acad. Nat. Sci. Phila. 1876, p. 260. *Arotus hieroglyphus* (Cope), Bull. U. S. Geol. Surv. Terr. III, 1877, p. 574.
As an amphibian clasping organ, Roy L. Moodie, Biol. Bull. XIV, 1908, p. 252, fig. 3. . . . . Cope Coll.
Laramie (Cretac.): Montana.

Ctenodus angustus Newberry. See *Sagenodus angustus* (Newb.).
" fleisheri Newberry. " *Dipterus fleisheri* (Newb.).
" porrectus Cope. " *Sagenodus porrectus* (Cope).
" serratus Newberry. " " *serratus* (Newb.).

Ctenodus wagneri Newberry 1889.

Type 408 Large well-preserved dental plate attached to splenial. *C. wagneri* Newberry, Paleoz. Fishes N. Amer. 1889, p. 172, pl. xxvii, fig. 30 . . . . Newb. Coll.
Cleveland shale (Upper Devon.): Near Cleveland, Ohio.

Dipterus contraversus Hay 1899.

Type 5329 Dental element, in matrix. *D. radiatus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 119, pl. xxvii, fig. 33. *D. contraversus* Hay, Amer. Natural. XXXIII, 1899, p. 786 . . Newb. Coll.
Catskill: Tioga Co., Pa.

Dipterus flabelliformis Newberry 1889.

Type 369 370 Dental element in matrix and counterpart. *D. flabelliformis* Newberry, Paleoz. Fishes N. Amer. 1889, p. 90, pl. xxvii, fig. 21 . . . . Newb. Coll.
Chemung: Warren, Pa.

Figured 374a Dental element of young fish. *Loc. cit.* pl. xxvii, fig. 21a. Formation and locality same as preceding . . . Newb. Coll.

Dipterus fleisheri (Newberry) 1897.

Type 5289 Dental element. *Ctenodus fleisheri* NEWBERRY, Trans. N. Y. Acad. Sci. XVI, 1897, p. 302, pl. xxiv, fig. 25. Newb. Coll.
Catskill: Troy, Pa.

DIPTERUS LEVIS Newberry. See *D. nelsoni* Newb.

Dipterus nelsoni Newberry 1889.

Figured 374b Worn dental element, in matrix. Cotype of *D. levis* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 90, pl. xxvii, fig. 22.
Chemung: Warren, Pa. Newb. Coll.

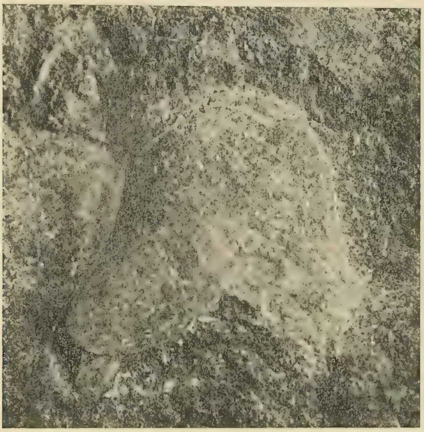

Fig. 24.— *Ganorhynchus oblongus* Cope. Labial cartilage. × 3½. Type; No. 2804.

Figured 374 Much worn dental element, in matrix. *Loc. cit.* pl. xxvii, fig. 23. Formation and locality as preceding . . . . Newb. Coll.

DIPTERUS RADIATUS Newberry. See *D. contraversus* Hay.

Dipterus sherwoodi Newberry 1875.

Type 357 Dental element, in matrix. *D. sherwoodi* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 61, pl. lviii, figs. 17–17b; Paleoz. Fishes N. Amer. 1889, p. 118, pl. xxvii, figs. 32–32b.
Catskill: Tioga Co., Pa. Newb. Coll.

Dipterus uddeni Eastman 1900.

Cast 7551 Dental plate; cast of type. *D. uddeni* EASTMAN, Journ. Geol. VIII, 1900, p. 37, figs. 5, 5^1; N. Y. State Mus. Mem. 10, p. 160, pl. iv, figs. 3, 4.
Cedar valley limest. (Mid. Devon.): New Buffalo, Iowa.

Ganorhynchus oblongus Cope 1892. (Fig. 24.)

Type 2804 Labial cartilage in matrix. *G. oblongus* COPE, Proc. Amer. Philos. Soc. XXX, 1892, p. 225. Cope Coll.
Catskill: Mansfield, Tioga Co., Pa.

Gnathorhiza serrata[1] Cope 1883. (Fig. 25.)

Type 7258 One small dental element. *G. serrata* COPE, Proc. Amer. Philos. Soc. XX, 1883, p. 629. Cope Coll.
Permian: Texas.

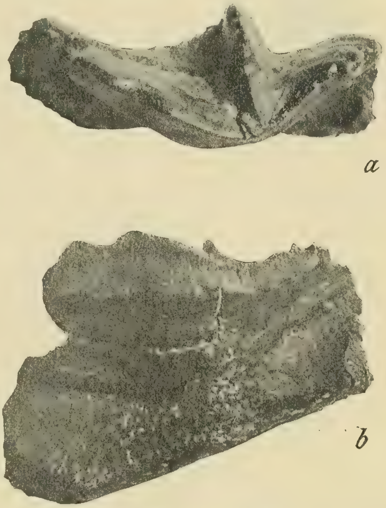

Fig. 25. — *Gnathorhiza serrata* (Cope). Dental plate. × 4. *a*, oral aspect; *b*, outer aspect. Type; No. 7258.

HELIODUS LESLEYI Newberry. See *Palædaphus lesleyi* (Newb.).

Palædaphus lesleyi (Newberry) 1875.

Type 415 Upper dental element, in matrix. *Heliodus lesleyi* NEWBERRY, Rept. Geol. Surv. Ohio, Palæont. II, 1875, p. 64, pl. lviii, fig. 18; Paleoz. Fishes, 1889, p. 86, pl. xviii, fig. 3. Newb. Coll.
Chemung: Tioga Co., Pa.

Sagenodus angustus (Newberry) 1897.

Type 5286 Lower right dental element on block of sandstone. *Ctenodus angustus Newberry*, Trans. N. Y. Acad. Sci. XVI, 1897, p. 303, pl. xxiv, fig. 26 . . . . Newb. Coll.
Catskill: Troy, Bradford Co., Pa.

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[1] *Sagenodus pertenuis* Eastman (Amer. Naturalist XXXVII, 1903, p. 493) is apparently referable to this species.

Sagenodus porrectus (Cope) 1878. (Fig. 26.)

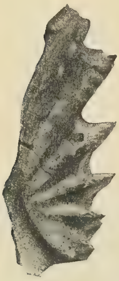

Fig. 26.— *Sagenodus porrectus* (Cope). Dental plate; natural size. Type; No. 7235.

Type 7235 — One dental plate. *Ctenodus porrectus* Cope, Proc. Amer. Philos. Soc. XVII, 1878, p. 527.
Permian: Texas. Cope Coll.

Sagenodus serratus (Newberry) 1875.

Type 481 — Impression of dental plate in coal and a squeeze of same. *Ctenodus serratus* Newberry, Rept. Geol. Surv. Ohio, Pal. II, 1875, p. 59, pl. lviii, figs. 15, 15a; Paleoz. Fishes 1889, p. 226, pl. xxvii, figs. 31, 31a . . . Newb. Coll.
Coal Measures: Linton, Jefferson Co., Ohio.

TELEOSTOMI Owen 1866.

I. Crossopterygii Cope 1872.

Cœlacanthus elegans Newberry 1856. (Pl. IV, fig. 1.)

Coal Measures: Linton (now Yellow Creek), Jefferson Co., Ohio.

Cotype 503, 656 — Nearly complete fish, lacking only the posterior extremity of the caudal fin. Counterpart, No. 656. *C. elegans* Newberry, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 98. Newb. Coll.

Cotype 2024 — Anterior half of fish. *Loc. cit.* p. 98 . . . . . Newb. Coll.

2929 — Nearly complete fish. Type of *Conchiopsis filiferus* Cope. Proc. Acad. Nat. Sci. Phila. XXIV, 1873, p. 342 . . Cope Coll.

Cœlacanthus ornatus Newberry 1856. (Pl. IV, fig. 2.)

Type 1135 — Small fish lacking the caudal fin. *C. ornatus* Newberry, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 98 . . Newb. Coll.
Coal Measures: Linton, Jefferson Co., Ohio.

Cœlosteus ferox Newberry. See page 29.
Conchiopsis filiferus Cope. See *Cœlacanthus elegans* Newb. No. 2929.

Diplurus longicaudatus Newberry 1878.

Type 630 — Almost complete fish, 68 cm. long, lacking only the supplemental caudal; on slab of shale. *D. longicaudatus* Newberry, Annals N. Y. Acad. Sci. I, 1878, p. 127; Mon. U. S. Geol. Surv. XVI, 1888, p. 74, pl. xx, fig. 1 . . . . . . Newb. Coll.
Newark series (Triassic): Boonton, N. J.

Paratype 680 1528 — Supplemental caudal fin and counterpart; apparently fragments of the large fish mentioned in the description (1888, p. 74). The fragments are labeled in Newberry's handwriting "specimen No. 1." *Loc. cit.* 1878; 1888, pl. xx, fig. 2 . Newb. Coll.
Newark series (Triassic): Boonton, N. J.

Figured 627 629 — Portion of a fish larger than the type specimen preserved in counterpart from the region of the orbit to a line somewhat back of termination of ventral fins. It exhibits bones of opercular region (imperfect), the first dorsal, the pectoral and ventral fins, also scales showing characteristic ornamentation. Some of the last figured. *D. longicaudatus* Newberry, *Loc. cit.* 1888, pl. xx, figs. 3, 5? . . . . Newb. Coll.
Triassic: Durham, Conn.

Figured 1532 — Fragment showing some scales and scattered fin-rays. A group of three scales figured (*loc. cit.* 1888, pl. xx, fig. 4). Newb. Coll.
Triassic: Durham, Conn.

Ectosteorhachis nitidus Cope. See *Parabatrachus nitidus* (Cope).

Holoptychius americanus Leidy 1856.

Figured $\frac{4976}{1}$ — Scale. *H. nobilissimus* Ag., Hall, Geol. N. Y., Surv. Fourth Geol. Dist. 1843, p. 281, cut 130, fig. 2 (?) . . Jas. Hall Coll.
Catskill: near Blossburg, Pa.

Figured 3334 — Part of a tooth in sandstone. *Loc. cit.* cut 130, fig. 4. Formation and locality same as preceding.

Figured 6038 — Scale. *H. americanus* Leidy, Newberry, Paleoz. Fishes N. Amer. 1889, p. 113, pl. xix, fig. 13 . . . . Newb. Coll.
Catskill: Tioga Co., Pa.

Figured 6048 — Scale. Newberry *loc. cit.* pl. xix, fig. 12 . . Newb. Coll.
Formation and locality as preceding.

Holoptychius filosus Cope 1892.

Type 2592 Impression of a large scale (?) in sandstone. Probably a plate of *Holonema*. *H. filosus* Cope, Proc. Acad. Nat. Sci. Phila. XXX, 1892, p. 228, pl. vii, fig. 3 . . . . Cope Coll.
Chemung: LeRoy, Bradford Co., Pa.

Holoptychius giganteus ? Agassiz 1844.

Figured 1026 Scale. *H. giganteus* Ag., Newberry, Paleoz. Fishes N. Amer. 1889, p. 101, pl. xix, fig. 15 . . . . Newb. Coll.
Catskill: Tioga Co., Pa.

Figured 1901 Scale. *Loc. cit.* fig. 16. Formation and locality as preceding. Newb. Coll.

Holoptychius nobilissimus Agassiz 1839.

Cast 7589 Cast of type specimen: fish lacking caudal fin, ventral aspect. *H. nobilissimus* Agassiz, in Murchison's Silur. Syst. p. 600, pl. ii, *bis*, figs. 1, 2; Hugh Miller, Old Red Sandstone, pl. x, fig. 2. (Boston 1852, from 4th London ed.)
Upper Old Red Sandstone: Clashbennie, Perthshire.

Holoptychius ? pustulosus Newberry 1889.

Figured 6801 Apparently a fragment of a tubercled arthrodiran plate figured by Newberry as a scale of *H. ? pustulosus*; partly represented by impression in the matrix. Paleoz. Fishes N. Amer. 1889, pl. xx, fig. 11a . . . . Newb. Coll.
Chemung: Warren, Pa.

Holoptychius radiatus Newberry 1889.

Cotype 3343 Two scales and a fragment, on sandstone. *H. ? radiatus* Newberry, Paleoz. Fishes N. Amer. 1889, p. 115, pl. xx, fig. 12.
Catskill: Near Blossburg, Pa. Jas. Hall Coll.

Cotype 5295 Many small scales and some fin-rays on a block of sandstone. *Loc. cit.* pl. xx, figs. 13, 14. Formation and locality same as preceding . . . . Newb. Coll.

Holoptychius tuberculatus Newberry 1889.

Type 6568 — One scale in sandstone. *H. tuberculatus* NEWBERRY, Paleoz. Fishes N. Amer. 1889, p. 101, pl. xix, fig. 14 . Newb. Coll.
Chemung: Le Roy, Bradford Co., Pa.

Onychodus sigmoides Newberry 1857.

Delaware limestone (Mid. Devonian): Delaware, Ohio (unless otherwise specified).

Figured 256 — Left dentary showing inner aspect; exhibits 22 teeth. *O. sigmoides* NEWBERRY, Rept. Geol. Surv. Ohio, Pal. I, 1873, p. 299, pl. xxvii, fig. 1; Paleoz. Fishes N. Amer. 1889, p. 56, pl. xxxvi, fig. 1 . . . . Newb. Coll.

Figured 257 — Left dentary showing outer aspect; exhibits 22 laniary teeth and 2 of the symphyseal series. *Loc. cit.* 1873, pl. xxvii, figs. 2, 2a; 1889, pl. xxxvi, figs. 2, 2a . . . . . Newb. Coll.

Figured 263 — A series of three large symphyseal teeth. *Loc. cit.* 1873, pl. xxvi, fig. 1 . . . . Newb. Coll.

Figured 295 — Small right mandible showing outer aspect; exhibits about 21 laniary teeth. *Loc. cit.* 1873, pl. xxvi, figs. 4, 4a; 1889, pl. xxxvi, figs. 4, 4a . . . . Newb. Coll.

Figured 296 — Small left mandible showing outer face; exhibits 20 teeth. *Loc. cit.* 1873, pl. xxvi, fig. 5 . . . . Newb. Coll.

Figured 297 — Left jugular plate showing inner aspect. *Loc. cit.* 1889, pl. xxxvii, fig. 1 . . . . Newb. Coll.

Figured 298 — "Clavicle" showing inner aspect. *Loc. cit.* pl. xxxvii, fig. 7. Sandusky, Ohio . . . . Newb. Coll.

Figured 304 — Operculum, inner aspect. *Loc. cit.* pl. xxxvii, fig. 6. Newb. Coll.

Figured 4463 — Supratemporal, inner aspect. *Loc. cit.* pl. xxxvii, fig. 5. Newb. Coll.

Figured 4483 — Maxillary showing teeth. *Loc. cit.* pl. xxxiv, fig. 3. Newb. Coll.

Figured 4487 — Right jugular, inner aspect. *Loc. cit.* pl. xxxvii, fig. 2. Sandusky, Ohio . . . . Newb. Coll.

Figured 4499 — Infra-clavicle? "Sub-operculum" (Newb.). Exhibits outer face. *Loc. cit.* pl. xxxvii, fig. 9.

Figured 4501 “Sub-operculum” (Newb.): inner aspect. *Loc. cit.* pl. xxxvii, fig. 10 . . . . Newb. Coll.

Figured 4509 Anterior half of a pair of frontals (?) in natural association; inner aspect. *Loc. cit.* pl. xxxvii, fig. 4. Sandusky, Ohio. Newb. Coll.

Figured 4518 Parietal element showing inner aspect. *Loc. cit.* pl. xxxvii, fig. 8. Newb. Coll.

Figured 4520 Entire frontal (?) element, inner aspect. *Loc. cit.* pl. xxxvii, fig. 3 . . . . Newb. Coll.

Parabatrachus nitidus (Cope) 1880.

Type 7239 Head and large part of body. *Ectosteorhachis nitidus* Cope, Proc. Acad. Nat. Sci. Phila. XIX, 1880, p. 52; *Megalichthys nitidus* Cope, Proc. U. S. Nat. Mus. XIV, 1891, p. 457, pl. xxxii, figs. 8, 9. *Parabatrachus nitidus* (Cope), Hay, Amer. Natural. XXXIII, 1899, p. 788 . . . . Cope, Coll.
Permian: Texas.

Rhizodus anceps Newberry 1888.

Type 224 Anterior half of a large right mandible showing two large and many small teeth; in limestone. *Rhizodus anceps* Newberry, Trans. N. Y. Acad. Sci. VII, 1888, p. 165; Paleoz. Fishes N. Amer. 1889, p. 191, pl. xliii, fig. 1 . . . . . . Newb. Coll.
St. Louis limestone (Subcarbon.): Alton, Ill.

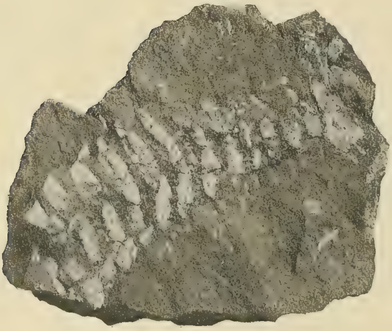

Fig. 27. — *Sauripteris taylori* Hall. Part of the type specimen (No. 3341) showing neural arches. × ¼.

Sauripteris taylori Hall 1843. (Figs. 27 and 28.)

Type 3341 Right “clavicle” and pectoral fin; an imperfectly preserved mandible or maxillary; over a dozen neural arches. *S. taylori* Hall, Geol. N. Y., Surv. 4th Geol. Dist. 1843, p. 281, pl. iii, fig. 1 and woodcut 131. Also 3 scales on two pieces of sandstone separately catalogued as No. 3340 (*loc. cit.* p. 281 cut 130, fig. 1, and pl. iii, figs. 2, 3). Jas. Hall Coll.
Catskill: Blossburg, Pa.

II. Actinopteri Cope 1872.

Acentrophorus chicopensis Newberry 1888.

Cotype 678
Entire fish on tablet of shale. *A. chicopensis* Newberry, Mon U. S. Geol. Surv. XIV, 1888, p. 69, pl. xix, fig. 4 . Newb. Coll.
Triassic: Chicopee Falls, Mass.

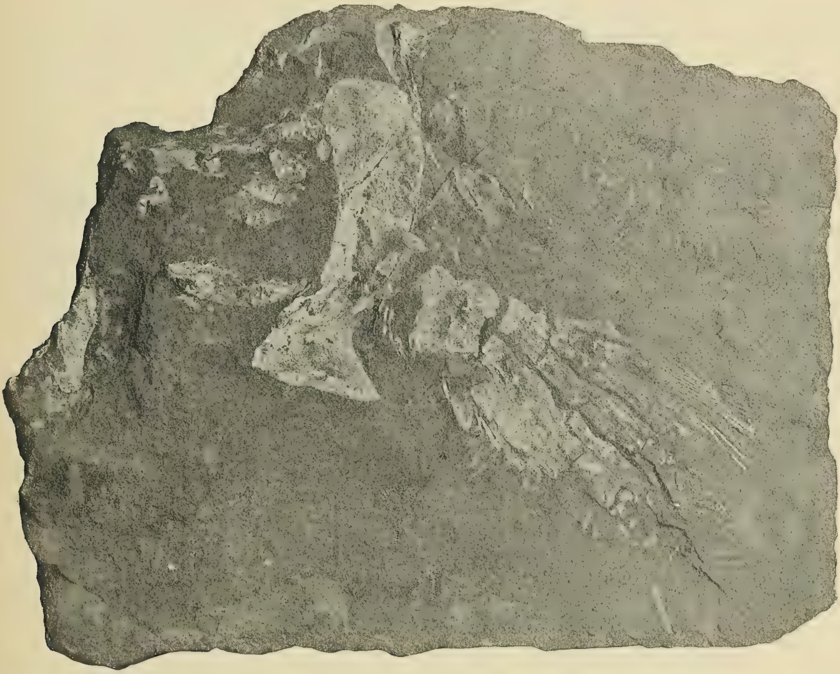

Fig. 28.— *Sauripteris taylori* Hall. Right "clavicle" and pectoral fin. × ¼. Type; No. 3341.

Acrognathus dodgei Hay 1903.

Type 3673
Well-preserved fish lacking pectorals. *A. dodgei* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 427, pl. xxxiv, fig. 3.
Mt. Lebanon Coll.
Upper Cretac.: Hajula, Mt. Lebanon, Syria.

Actinophorus clarkii Newberry. See *Tegeolepis clarki* (Newb.).
Aipichthys formosus Hay. " *A. minor* (Pictet).

Aipichthys minor (Pictet) 1850.

Figured 3831 Imperfectly-preserved fish lacking greater part of head. Type of *A. formosus* Hay. Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 445, pl. xxxii, figs. 2, 3. Catalogued by Dr. O. P. Hay in Amer. Mus. catalog as *A. minor* Pictet. Mt. Lebanon Coll.
Upper Cretac.: Hajula, Mt. Lebanon, Syria.

Alburnops angustarcus Cope. See *Notropis angustarcus* (Cope).

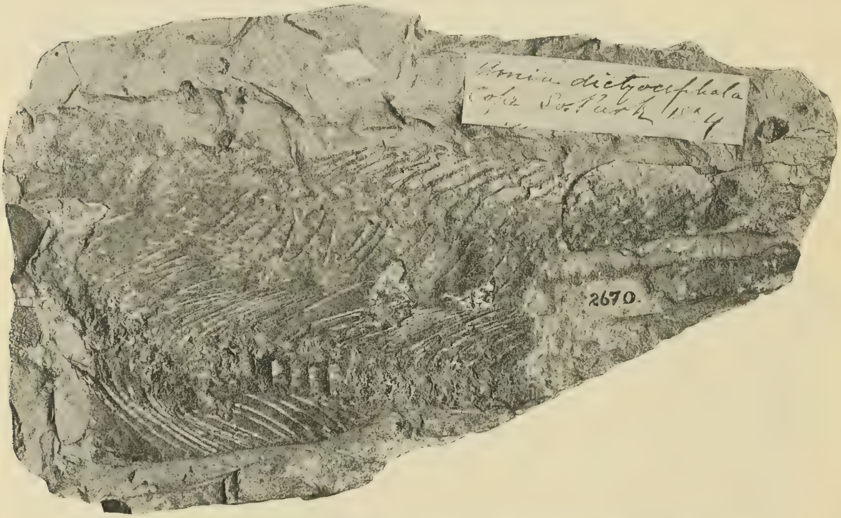

Fig. 29.— *Amia dictyocephala* Cope. Trunk of fish. × ½. Type; No. 2670.

Amia dictyocephala Cope 1875. (Fig. 29.)

Type 2670 Poorly-preserved fish lacking head, tail and all fins except the dorsal. It shows vertebræ, ribs and general proportions of the fish. This is not the specimen figured by Cope in 1884. *A. dictyocephala* Cope, Bull. U. S. Geol. Surv. Terr. [2], No. 1, 1875, p. 3; Tert. Vert. 1884, p. 745 . . . . . . Cope Coll.
Amyzon shales (Eocene): South Park, Colo.

Paratype 2671 Caudal fin. *Loc. cit.* 1884, p. 746. Formation and locality as preceding . . . . Cope Coll.

Anguillavus bathshebæ Hay 1903.

Type 3704 Nearly complete fish. Shows dorsal, anal and ventral fins; also a distinct caudal. *A. bathshebæ* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 439, pl. xxxvii, fig. 1. Mt. Lebanon Coll.
Upper Cretac.: Hakel, Mt. Lebanon, Syria.

Paratype 3685 Posterior half of fish showing dorsal, anal, caudal and ventral fins. *Loc. cit.* p. 439. . . . . Mt. Lebanon Coll.
Upper Cretac.: Hajula, Mt. Lebanon, Syria.

Anguillavus quadripinnis Hay 1903.

Type 3796 Fish lacking the caudal region; shows ventral fins. *A. quadripinnis* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 437, pl. xxxvi, figs. 2, 3 . . . . Mt. Lebanon Coll.
Upper Cretac.: Hajula, Mt. Lebanon, Syria.

Anogmius altus ? (Loomis) 1900.

Figured 2112 Part of skull. *A. altus?* (Loomis), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 41, figs. 27–32. . Cope Coll.
Niobrara (Cretac.): Gove Co., Kans.

Anogmius aratus Cope 1877. (Fig. 30.)

Type 2403 Large fish mainly out of matrix, showing head elements and anterior two-thirds of body. Tail region on a separate piece of matrix. *A. aratus* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 585. Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 34, pl. ii, and text figs. 23–25 . . . . Cope Coll.
Niobrara (Cretac.): Kansas.

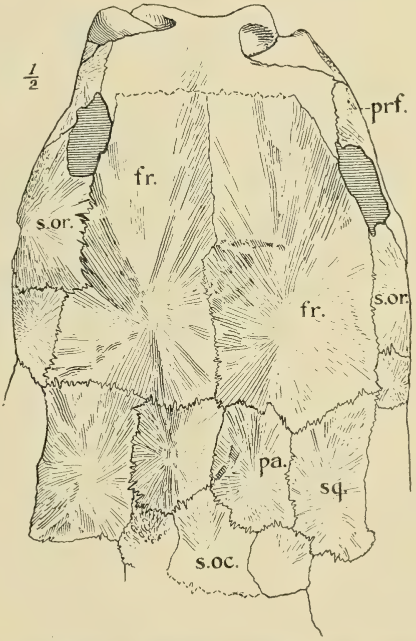

Fig. 30.—*Anogmius aratus* Cope. Head from above. Type; No. 2403. *fr.*, frontal; *pa.*, parietal; *prf.*, prefrontal; *s. oc.*, supraoccipital; *s. or.*, supraorbital; *sq.*, squamosal. (From O. P. Hay).

Anogmius evolutus Cope 1877.

Type 2101	Left lower jaw and some undetermined bones. *A. evolutus* Cope, Proc. Amer. Philos. Soc. XVII, 1877, p. 179. Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 46, fig. 37 . Cope Coll. Niobrara (Cretac.): Kansas.

Anogmius favirostris Cope 1877.

Type 2111	Skull with jaws, palatine and vomer; eleven vertebræ. *A. favirostris* Cope, Proc. Amer. Philos. Soc. XVII, 1877, p. 178. Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 30, figs. 18, 19. Niobrara (Cretac.): Gove Co., Kans. Cope Coll.
Paratype 2109	Anterior half of skull showing maxillæ, premaxillæ and dentaries in place. Upper surface imperfectly preserved. *A. favirostris* Cope, Proc. Amer. Philos. Soc. XVII, 1877, p. 178. Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 32, figs. 20–22. Niobrara (Cretac.): Gove Co., Kans. Cope Coll.

Anogmius sp.

Figured 994	Lower dental plate. Hay, *loc. cit.* p. 44, figs. 33, 34. Niobrara (Cretac.): Butte Creek, Kans.
Figured 1616	Posterior region of a crushed cranium, 24 vertebræ, lower anterior dental plate (fig. 35), and caudal peduncle with 5 vertebræ (fig. 16). Hay, *loc. cit.* p. 45, figs. 35, 36 and p. 27, fig. 16. Niobrara (Cretac.): Gove Co., Kans. Cope Coll.
Figured 1977	11 vertebræ and caudal peduncle with 5 vertebræ. Hay, *loc. cit.* p. 27, fig. 15 . . . . Cope Coll. Niobrara (Cretac.): Gove Co., Kans.
Figured 2055	Caudal peduncle with 7 vertebræ; caudal fin rays. Hay, *loc. cit.* p. 30, fig. 17 . . . . Cope Coll. Niobrara (Cretac.): Gove Co., Kans.

Apsopelix sauriformis Cope 1871.

Type 1602	Fish lacking both head and tail. *A. sauriformis* Cope, Ann. Rept. Dir. U. S. Geol. Surv. 1871, p. 424; Cret. Vert. 1875, p. 242, pl. xlii, fig. 6 . . . . Cope Coll. Cretaceous: Bunker Hill, Kans.

Asineops squamifrons Cope 1870.

Eocene: Green River, Wyoming.

Cotype 2542 Fish lacking tip of caudal fin; on shale. *A. squamifrons* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 381; Tert. Vert. 1884, p. 85, pl. xi, fig. 1 . . . . Cope Coll.

Cotype 2691 Posterior two-thirds of a fish, showing dorsal, ventral, anal and caudal fins. *Loc. cit.* 1870; 1884, pl. xi, fig. 3 . . Cope Coll.

Cotype 2532 Head and anterior portion of trunk *Loc. cit.* 1884, p. 85, pl. xi, fig. 2 . . . . Cope Coll.

Cotype 2692 Posterior two-thirds of a fish, showing dorsal, anal, caudal and ventral fins. *Loc. cit.* 1884, p. 85, pl. xi, fig. 4 . Cope Coll.

2546 Portion of the trunk and tail of a fish, on shale. Type of *A. viridensis* Cope. Proc. Amer. Philos. Soc. XI, 1870, p. 381; *A. squamifrons* Cope, *Loc. cit.* 1884, p. 87 . . . Cope Coll.

Asineops viridensis Cope. See *A. squamifrons* Cope No. 2546.

Beryx insculptus Cope 1869. (Fig. 31.)

Type 7530 Portion of the trunk of a fish covered with scales. *B. insculptus* Cope, Proc. Amer. Philos. Soc. XI, 1869, p. 240; Cret. Vert. p. 272, pl. lii, figs. 4, 4a . . . . Cope Coll.
Greensand (Cretac.): New Jersey.

Catopterus gracilis J. H. Redfield 1837.

The following specimens are from the Newark series (Triassic) of Boonton, N. J.

Figured 592 Fish on shale. "Mature individual, broad form" (Newb.). *C. gracilis* J. H. Redf., Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 55, pl. xvi, fig. 1 . . . . Newb. Coll.

Figured 663 Posterior half of a slender fish, showing dorsal, caudal and anal fins. *Loc. cit.* pl. xvii, fig. 2 . . . . Newb. Coll.

Figured 1556 Posterior half of a fish, showing dorsal, caudal and anal fins. *Loc. cit.* pl. xvi, fig. 3 . . . . Newb. Coll.

Figured 578 Small distorted fish. Newberry's label reads "*Catopterus parvulus* W. C. R. (young of *C. gracilis?*)." *Loc. cit.* p. 60, pl. xvi, fig. 4 . . . . Newb. Coll.

Figured 655 Small fish. *C. parvulus* W. C. Redf., Newberry, *loc. cit.* p. 60, pl. xvi, fig. 5 . . . . Newb. Coll.

CATOPTERUS MINOR Newberry. See *C. redfieldi* Egerton.

" PARVULUS W. C. Redf. See *C. gracilis,* J. H. Redf. Nos. 578, 655.

Catopterus redfieldi Egerton 1847.

The following specimens are from the Triassic of Durham, Conn.

Figured 631 Well-preserved fish on shale, showing all the fins. *C. redfieldi* Egert., NEWBERRY, Mon. U. S. Geol. Surv. XIV, 1888, p. 53, pl. xv, fig. 2 . . . . Newb Coll.

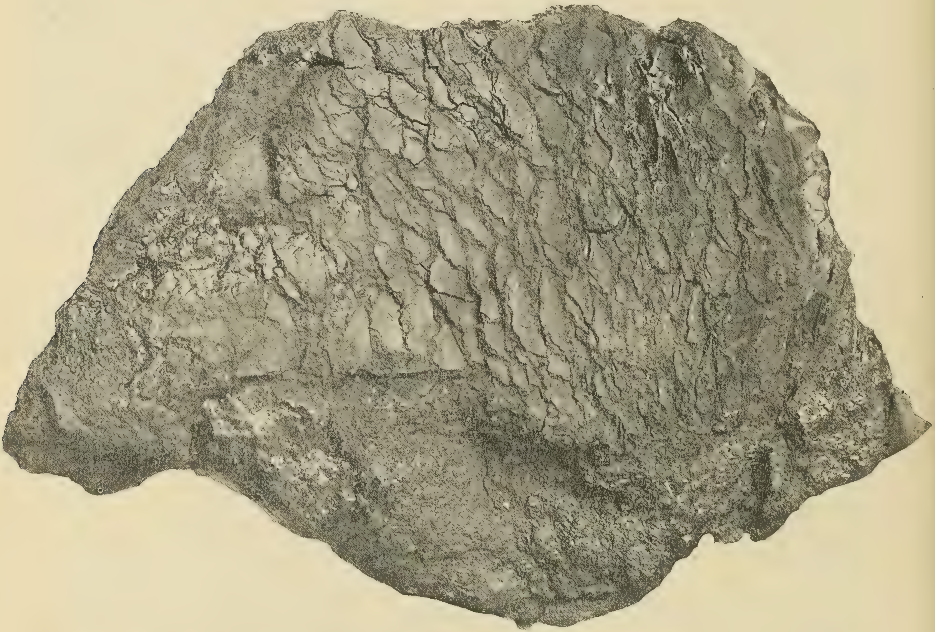

Fig. 31.—*Beryx insculptus* Cope. Portion of trunk covered with scales. × ⅔. Type; No. 7530.

Figured 636 Posterior half of a well-preserved fish. *Loc. cit.* pl. xv, fig. 3. Newb. Coll.

Figured 639 Somewhat distorted fish. A small individual of this species. Cotype of *C. minor* NEWBERRY, *loc. cit.* p. 57, pl. xvii, fig. 3. Newb. Coll.

Figured 648 Complete fish, rather small. Cotype of *C. minor* Newb. *Loc. cit.* pl. xvii, fig. 2 . . . . Newb. Coll.

Figured 650 Headless fish displaying the fins well. Cotype of *C. minor* Newb. *Loc. cit.* pl. xvii, fig. 1 . . . . Newb. Coll.

Catopterus sp. indet.

Figured 644 Small fish. Young? *Catopterus sp.* Newb. *Loc. cit.* p. 50, pl. xviii, fig. 4 . . . . Newb. Coll.

[1] **Catostomus batrachops** Cope 1883. (Fig. 32.)

Type 2638 Imperfectly-preserved cranium showing the upper surface. *C. batrachops* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 151 . . . . Cope Coll.
Pleistocene: Silver Lake, Oregon.

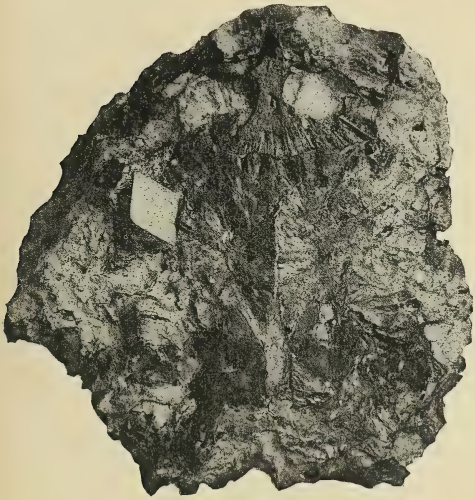

Fig. 32.

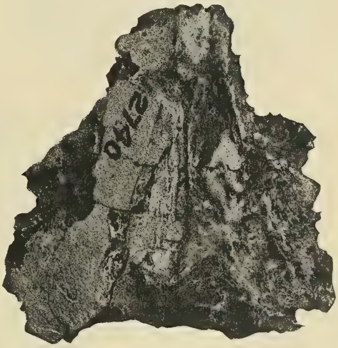

Fig. 33.

Fig. 32.— *Catostomus batrachops* Cope. Cranium. $\times \frac{3}{4}$. Type; No. 2638.
Fig. 33.— *Catostomus cristatus* Cope. Cranium; natural size. Type; No. 2740.

Catostomus cristatus Cope 1883. (Fig. 33.)

Type 2740 Fragmentary cranium lacking the ethmoid region. *C. cristatus* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 160.
Pleistocene: S. W. Idaho. Cope Coll.

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[1] As pointed out by President Jordan the Catostomidæ from the Pleistocene of Oregon probably belong to the genus *Chasmistes* Jordan and Gilbert, now living in the same region. Univ. of Cal. Publi. Bull. Dept. Geol. V, 1907, p. 140. Cf. descriptions of *Chasmistes* crania by E. C. Starks (Ibid. pp. 141–144).

"Catostomus reddingi" Cope 1883. (Fig. 34.)

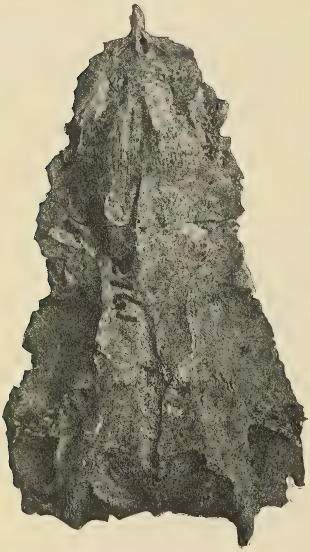

Fig. 34.—"Catostomus reddingi" Cope. Cranium; natural size. No. 2761.

2761 Cranium. Not described, but name mentioned in comparison with *C. cristatus*. Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 160. . . Cope Coll.

Cimolichthys semianceps Cope. See *C. nepaholica* (Cope) No. 1989.
Cimolichthys sulcatus Cope. See *C. nepaholica* (Cope) No. 1882.

Cimolichthys nepaholica (Cope) 1872.

Niobrara (Cretaceous): Kansas.

Type 1904 An imperfect palatine bearing teeth. (Identified by Dr. O. P. Hay). By Cope as "a portion of a right maxillary" (1872), and later as the "distal extremity of premaxillary" (1875). *Empo nepaholica* Cope, Proc. Amer. Philos. Soc. XII, 1872, p. 347; *E. nepæolica* Cope, Cret. Vert. 1875, p. 230, pl. xlix, fig. 9. Near Fossil Spring . . . . Cope Coll.

Figured 1736 Block of shale containing an imperfectly-preserved skull, some vertebræ, ribs, scales. *Loc. cit.* 1875, pl. lii, fig. 1. Rooks Co.? Cope Coll.

Figured 1737 Left palatine and fragments of the right; vomer; anterior portion of left dentary; fragments. Type of *Empo merrillii* Cope. Bull. U. S. Geol. Surv. Terr. I ser. No. 2, 1874, p. 46; Cret. Vert. 1875, p. 232, pl. liii, figs. 10–13. *Empo nepaholica* Cope, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 83. Ellis Co. Cope Coll.

Figured 1738 Large part of both palatines; vomer; left dentary and distal extremity of right; fragment of shoulder girdle (?). Type of *Empo contracta* Cope.— Bull. U. S. Geol. Surv. Terr. I ser. No. 2, 1874, p. 46; Cret. Vert. 1875, p. 232, pl. liii, figs. 14–17. *Empo nepaholica* Cope, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 83. Ten miles S. W. of Ellis . Cope Coll.

Figured 1739 Most of the figured dentary; palatine; basioccipital; three anterior vertebræ. Cope, *loc. cit.*, 1875, p. 230, pl. liii, figs. 3–5. Smoky Hill River, or Rooks Co. . . . Cope Coll.

Figured 1740 Large part of vertebral column represented by over 40 vertebræ; pectoral and caudal fins in place. One fragment shows four elongate lozenge-shaped scutes which Cope regarded as having been arranged in three series along the flanks of the abdomen. *Empo semianceps* Cope, Cret. Vert. 1875, p. 233, pl. liii, figs. 1, 1a. *E. nepaholica* Cope, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 83. Kansas . . . . Cope Coll.

Figured 1741 Block containing the quadrate, hyomandibular, portion of operculum and angular of left mandible. *E. semianceps* Cope, *loc. cit.* pl. liii, fig. 2. Hay, *loc. cit.* p. 83. Kansas. Cope Coll.

Figured 1742 Anterior half of left dentary, vomer, two scutes, an indeterminate bone bearing teeth. *Empo semianceps* Cope, *loc. cit.* pl. liii, figs. 6–9. Hay, *loc. cit.* Kansas . . . . Cope Coll.

Figured 1776 Skull in lateral view, showing anterior portion of cranium and the jaw elements; also portion of the shoulder girdle, base of pectoral fin, 4 vertebræ. Hay, *loc. cit.* p. 86, fig. 70. Cope Coll. (Fig. 35.)

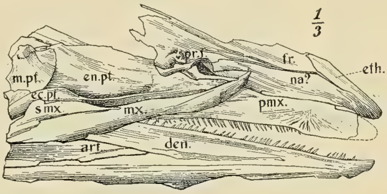

Fig. 35.— *Cimolichthys nepaholica* (Cope). Incomplete skull, lateral view. No. 1776, *art.*, articular; *den.*, dentary; *ec. pt.*, ectopterygoid; *en. pt.*, entopterygoid; *eth.*, ethmoid; *fr.*, frontal; *m. pt.*, metapterygoid; *mx.*, maxilla; *na ?*, nasal?; *pmx.*, premaxilla; *pr. f.*, postorbital; *smx.*, supramaxilla. (From O. P. Hay.)

Figured 1882 Anterior half of left mandible. Type of *Cimolichthys sulcatus* Cope. Proc. Amer. Philos. Soc. XII, 1872, p. 351; Cret. Vert. pl. l, fig. 8. *Empo nepaholica* Cope, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 82. Smoky Hill River, Kans. Cope Coll.

Figured 1969 Crushed cranium showing base. Hay, *loc. cit.* p. 87, fig. 71. Gove Co., Kans. . . . . Cope Coll.

1989 Imperfectly-preserved dentaries, a fragmentary palatine, many vertebræ, fragments of bones. Type of *Cimolichthys semianceps* Cope — Proc. Amer. Philos. Soc. XII, 1872, p. 351; *Empo semianceps* Cope, Cret. Vert. 1875, p. 233. Hay, *loc. cit.* p. 83. Kansas . . . . Cope Coll.

Figured 2032 24 vertebræ and incomplete caudal fin. Hay, *loc. cit.* p. 88, pl. i, fig. 4. Gove Co., Kans. . . . . Cope Coll.

Figured 2522 Cranium and jaws, crushed from above. Hay, *loc. cit.* p. 85, fig. 69. S. Fork Smoky Hill R., Kans. . . . . Cope Coll.

Clastes cuneatus Cope. See *Lepisosteus cuneatus* (Cope).
Cliola angustarca (Cope). " *Notropis angustarcus* (Cope).

Coccodus insignis Hay 1903.

The following specimens are from the Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Cotype 3700 Fish about 95 mm. long, in ventral aspect. It exhibits the lateral spines, ribs, caudal fin. The block is so broken as to show the occipital spine sunken in the matrix. *C. insignis* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 410, pl. xxix, fig. 3 Mt. Lebanon Coll.

Cotype 3702 Fish about 95 mm. long showing head, teeth, lateral spines and all fins. *Loc. cit.* pl. xxix, fig. 4 . . . Mt. Lebanon Coll.

Figured 3701 Fish lacking posterior third of body. Shows form of head, splenial teeth, lateral spines, impression of pectoral rays, ribs. *Loc. cit.* pl. xxix, fig. 5 . . . . Mt. Lebanon Coll.

Figured 3794 Anterior half of fish in ventral aspect. Shows the parasphenoid, lateral spines, pectoral fin rays, ventral fins, ventral fin support, dorsal fin and neural spines. *Loc. cit.* pl. xxix, fig. 2. Mt. Lebanon Coll.

Coccodus lindstrœmi Davis 1890.

Figured 3698 Imperfectly-preserved fish lacking caudal fin and the ventral line of body. It exhibits the orbit; the occipital spine, which has 14 denticles along its posterior body; 10 dorsal fin rays. Counterpart also preserved. *C. lindstrœmi* Davis, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 409, pl. xxix, fig. 1. Mt. Lebanon Coll.

Upper Cretaceous: Hakel, Mt. Lebanon, Syria.

Cottus cryptotremus Cope 1883. See *C. divaricatus* Cope.

Cottus divaricatus Cope 1883. (Fig. 36, *a*.)

Type? 2779 "Two preopercula agreeing apparently with the description of *C. divaricatus*. Appear also to be identical with *C. cryptotremus*." —Dr. O. P. Hay in card catalog Dept. Pal. Amer. Mus. Nat. Hist. *C. divaricatus* Cope, *loc. cit.* p. 162 . . . Cope Coll.

Equus beds (Pleist.): Willow Creek (?) Oregon.

2777 Two preopercula, imperfectly preserved. Types of *C. cryptotremus* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 163. (Fig. 36, *c.*) . . . . Cope Coll.
Equus beds (Pleist.): Castle Creek, Idaho.

Cottus hypoceras Cope 1883. (Fig. 36, *e.*)

Type Right preoperculum. *C. hypoceras* Cope, *loc. cit.* p. 164.
2775 Equus beds (Pleist.): Willow Creek (?) Oregon. Cope Coll.

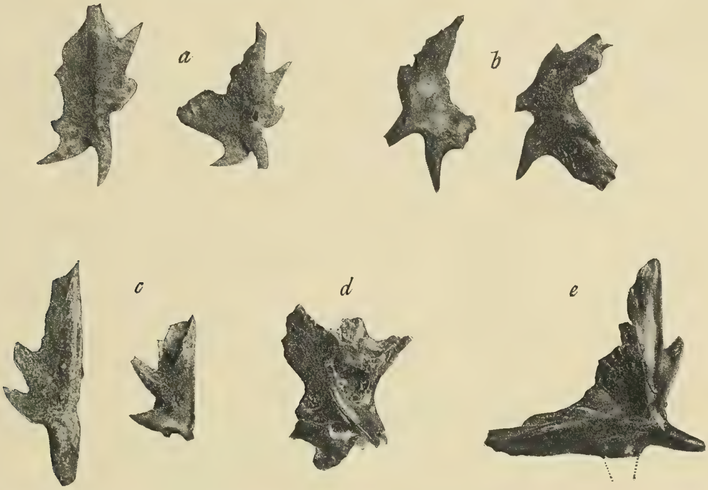

Fig. 36.— Preopercula of *Cottus*. × about 2.
a, C. divaricatus Cope; two preopercula, apparently the types. No. 2779.
b, C. idahoënsis Cope; two preopercula. Not published. No. 2780.
c. Two incomplete preopercula, the types of *C. cryptotremus* Cope, but apparently identical with *C. divaricatus.* The latter has priority. No. 2777.
d, C. pontifex Cope. Incomplete preoperculum, shown from inner aspect. Type; No. 2776.
e, C. hypoceras Cope. Type preoperculum, No. 2775.

Cottus pontifex Cope 1883. (Fig. 36, *d.*)

Type Right preoperculum. *C. pontifex* Cope, *loc. cit.* p. 163.
2776 Equus beds (Pleist.): Willow Creek, Oregon. Cope Coll.

Crossopholis magnicaudatus Cope 1883.

Type Imperfectly-preserved posterior half of a fish. It shows the
2455 heterocercal caudal, with strong fulcra along dorsal border; the dorsal fin with two series of internal fin supports; anal fin with some of its fin supports; origin of anal opposed to about the posterior third of the dorsal; lateral line; small ganoine

denticles in trunk region. *Crassopholis* (errore) *magnicaudatus* Cope, Amer. Natural. XVII, 1883, p. 1152; *Crossopholis magnicaudatus* Cope, Mem. Natl. Acad. Sci. III, 1886, p. 161, plate, fig. 2 . . . . Cope Coll.
Green River shales (Eocene): Twin Creek, Wyo.

Figured 2454 Imperfectly-preserved skull of a fish probably about a meter long, on a thin slab of shale. *Loc. cit.* 1886, plate, fig. 1. Formation and locality as preceding . . . . Cope Coll.

Ctenothrissa signifer Hay 1903.

Type 3651 Entire fish in counterpart. Some of bones and scales represented by impressions in the matrix. *C. signifer* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 417, pl. xxxi, figs. 1, 2. Mt. Lebanon Coll.
Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Paratype 3813 Posterior half of fish, showing long dorsal and anal fins. Hay, *loc. cit.* p. 418. . . . . Mt. Lebanon Coll.
Upper Cretac.: Hajula, Mt. Lebanon.

Dapedoglossus Cope. See *Phareodus* Leidy.
Daptinus phlebotomus Cope. See *Saurocephalus phlebotomus* Cope.

Diastichus strangulatus Cope 1883. (Pl. V, figs. 5, 6.)

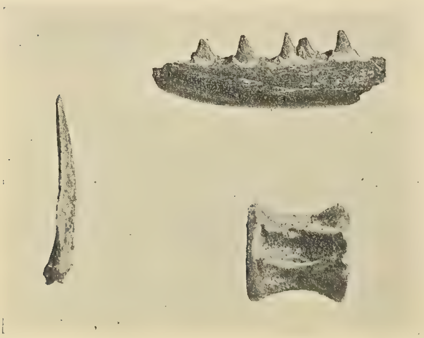

Fig. 37.— *Dictyodus silovianus* (Cope). Incomplete mandible, a fin-spine and a vertebra. × 1½. Type; No. 2298.

Cotype 2764 Pharyngeal bone with teeth; fragments of other bones. *D. strangulatus* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 158. Cope Coll.
Late Tertiary: S. Idaho.

Cotype? 2769 Pharyngeal bone retaining some of the teeth. *Loc. cit.* p. 158. Formation and locality as preceding . . . . Cope Coll.

Dictyodus silovianus (Cope) 1875. (Fig. 37.)

Type 2298 Portion of a mandible showing 5 teeth and alveoli of 4 more; two vertebræ; a small spine, finely striated. *Sphyrænodus silovianus* Cope, Proc. Amer. Philos. Soc. XIV, 1875, p. 362.
Miocene: Shiloh, Cumberland Co., N. J. Cope Coll.

Diplomystus altus (Leidy). See *Knightia alta* (Leidy).

Diplomystus dentatus Cope 1877.

Type 2477 Entire fish; head region not well preserved. *D. dentatus* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 809; Tert. Vert. 1884, p. 74, pl. x, fig. 1 . . . . Cope Coll.
Green R. shales (Eocene): Twin Creek, Wyo.

Empo contracta Cope. See *Cimolichthys nepaholica* No. 1738.
" merrillii " " " " " 1737.
" nepæolica " " " "

Enchelion montium Hay 1903.

Cotype 3765 Portion of vertebral column 143 mm. long, not reaching the head, composed of 264 vertebral discs. *E. montium* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 441, pl. xxxvii, fig. 2. Mt. Lebanon Coll.
Upper Cretaceous: Hakel, Mt. Lebanon, Syria.

Cotype 3766 Head and anterior portion of vertebral column; the latter composed of 110 vertebral discs, two for each pair of neural arches. Hay, *loc. cit.* pl. xxxvii, figs. 3–6. Formation and locality, same. Mt. Lebanon Coll.

Enchodus dolichus Cope 1875.

Type 1820 Palatine, lacking tooth. *E. dolichus* Cope, Cret. Vert. 1875, p. 239, pl. liv, figs. 8, 8a . . . . Cope Coll.
Niobrara (Cretac.): Kansas.

Figured 1837 Crushed skull showing most of the jaw elements. *E. dolichus* Cope, *loc. cit.* p. 300 (specimen "No. 1"); Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 73, fig. 52 . . . Cope Coll.
(Fig. 38.) Niobrara (Cretac.): Kansas.

Figured 1865 Considerable portion of the skull; palatines and anterior end of dentary. Hay, *loc. cit.* p. 73, fig. 53 . . . . . . Cope Coll.
Rooks Co., Kans.

Enchodus ferox Leidy 1855.

Figured 2251 Palatine with fang. *E. ferox* Leidy, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 68, fig. 50 (No. 2251 *non* 2250 — *errore*).
Cretaceous: New Jersey. Cope Coll.

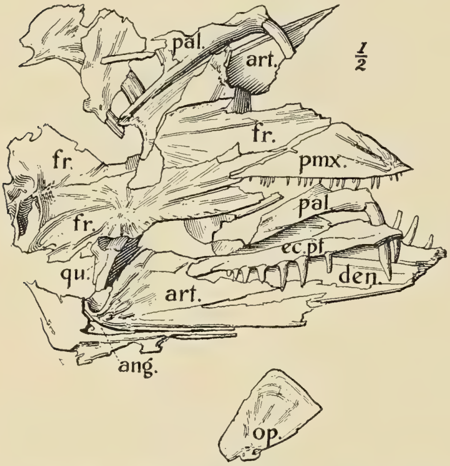

Fig. 38.— *Enchodus dolichus* Cope. Crushed skull. No 1837 *ang.* angular; *art.*, articular; *den.*, dentary; *ec. pt.*, ectopterygoid; *fr.*, frontal; *op.*, operculum; *pal.*, palatine; *pmx.*, premaxilla; *qu.*, quadrate. (From O. P. Hay.)

Enchodus gladiolus (Cope) 1872.

Figured 1818 Crushed occipital region of cranium, palatine, pterygoid, portion of dentary. Labeled in Cope's hand *Enchodus? gladiolus.* Hay, *loc. cit.* p. 75, figs. 56, 57 . Cope Coll.
Niobrara (Cretac.): Near Solomon River, Kans.

Enchodus gentryi (Cope) 1875.

Type 2299 One tooth lacking base of attachment. Type of *Phasganodus gentryi* Cope. Proc. Amer. Philos. Soc. XIV, 1875, p. 362 . . . . Cope Coll.
Miocene: Shiloh, Cumberland Co., N. J.

Enchodus marchesetti? (Kramberger) 1895.

Figured 3779 Imperfectly-preserved fish, lacking the lower jaw, tail and part of back. Shows the non-overlapping dorsal scutes. *E. marchesettii?* (Kramb.), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 421, pl. xxx, fig. 2 . . . . Mt. Lebanon Coll.
Upper Cretaceous: Hakel, Mt. Lebanon, Syria.

Figured 3859 Trunk and tail, showing dorsal, ventral, anal and caudal fins. *Loc. cit.* pl. xxx, fig. 3. Formation and locality as preceding.
Mt. Lebanon Coll.

Enchodus petrosus Cope 1874.

Type 1608 Posterior portion of base of cranium, right palatine and portion of ectopterygoid, distal extremity of dentary; three vertebræ (which may not belong to this specimen). *E. petrosus* Cope. Bull. U. S. Geol. Surv. Terr. I ser. No. 2, 1874, p. 44; Cret. Vert. 1875, p. 239, pl. liv, figs. 4–7. Fig. 7 represents the three vertebræ mentioned above but is erroneously labeled in Cope's explanation of figures . . . . Cope Coll.
Niobrara (Cretac.): Kansas.

Figured 1605 Both palatines, lacking fangs; distal ends of dentaries. Type of *Tetheodus pephredo* Cope.— Bull. U. S. Geol. Surv. Terr. I ser. No. 2, 1874, p. 43; Cret. Vert. 1875, p. 237, pl. liv, figs. 1–3. *E. petrosus* Cope, Hay, *loc. cit.* p. 70 . . . Cope Coll.
Niobrara (Cretac.): Phillips Co., Kans.

Figured 2062 Both palatines, one with fang; right dentary (figured). Hay, *loc. cit.* p. 71, fig. 51 . . . . Cope Coll.
Niobrara (Cretac.): S. Fork Solomon R., Kans.

Enchodus sævus Hay 1903.

Type 198 Skull, jaws, opercular bones, vertebræ and various fragments of a large fish. *E. sævus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 76, figs. 58, 60–61, 63–65 . Amer. Mus. Exped. 1897.
Niobrara (Cretac.): Elkader, Logan Co., Kans.

Enchodus tetræcus Cope 1875.

Type 2248 One palatine tooth. *E. tetræcus* Cope, Cret. Vert. 1875, p. 278; Hay, *loc. cit.* p. 74, fig. 54 . . . . Cope Coll.
Cretaceous: St. Georges, Del.

Paratype 2249 One palatine tooth lacking distal extremity. Cope, *loc. cit.* p. 278; Hay, *loc. cit.* fig. 55 . . . . Cope Coll.
Cretaceous: Delaware.

ERISICHTHE DIMIDIATA Cope. See *Protosphyræna dimidiata* (Cope).
" NITIDA Cope. " " *nitida* (Cope).
" PENETRANS Cope. " " " (Cope)
No. 2105.
" ZIPHIOIDES Cope. " " *ziphioides* (Cope).

Erismatopterus levatus Cope 1870.

Eocene: Green River, Wyo.

Cotype 2695 Small fish on shale. "No. 2" of Cope's description. *E. levatus* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 382; Tert. Vert. 1884, p. 80 . . . . Cope Coll.

Cotype 2696 Small fish lacking snout-portion of head. *Loc. cit.* 1884, pl. ix, fig. 6 . . . . Cope Coll.

Cotype 2526 Two headless fishes; one figured. *Loc. cit.* 1884, pl. ix, fig. 7. Cope Coll.

Erismatopterus rickseckeri Cope 1871.

Type 2800 Two small fishes lacking caudals, on shale. *E. rickseckeri* Cope, U. S. Geol. Surv. Wyo., 1871, p. 427; Tert. Vert. 1884, p. 81, pl. vi, fig. 2 . . . . Cope Coll.
Eocene: Green River, Wyo.

EURYLEPIS CORRUGATUS Newberry. See *Haplolepis corrugata* (Newb.).
" LINEATUS " " *Rhadinichthys? lineatus* (Newb.).
" ORNATISSIMUS " " *Haplolepis ornatissima* (Newb.).

Gillicus arcuatus (Cope) 1875.

Figured 7377 Maxilla, preoperculum and scales on block of shale. *G. arcuatus* (Cope), Hay, Amer. Journ. Sci. 4 ser, VI, 1898, p. 232, fig. 5.
Niobrara (Cretac.): Kansas. Hay Coll.

Gonatodus brainerdi (Thomas) 1853.

Figured 333 Entire fish showing dorsal aspect. *G. brainerdi* (Thomas), Newberry, Paleoz. Fishes N. Amer. 1889, p. 125, pl. xxxiv, fig. 2 . . . . Newb. Coll.
Berea grit (Subcarbon.): Chagrin Falls, Ohio.

Haplolepis corrugata (Newberry) 1856.

Type 452 Small fish on coal; caudal fin injured. *Mecolepis corrugatus* Newberry, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 96; *Eurylepis corrugatus* Newb. Rept. Geol. Surv. Ohio, Pal. I, 1873, p. 350, pl. xxxviii, fig. 4. *Haplolepis corrugata* (Newb.),

S. A. Miller, First Appendix [to N. Amer. Geol. and Pal.] 1892, p. 715. . . . . Newb. Coll.
Coal Measures: Linton, Ohio.

Haplolepis ornatissima (Newberry) 1856.

Type 445 Small headless fish on coal. *Mecolepis ornatissimus* Newberry, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 97; *Eurylepis ornatissimus* Newb. Rept. Geol. Surv. Ohio, Pal. I, 1873, p. 352. *Haplolepis ornatissima* (Newb.), S. A. Miller, *loc. cit.* p. 715 . . . . Newb. Coll.
Coal Measures: Linton, Ohio.

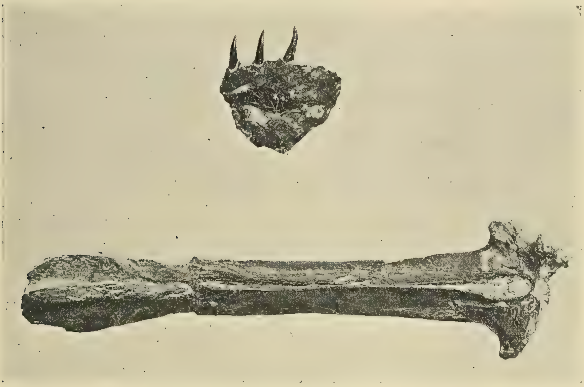

Fig. 39.— *Ichthyodectes acanthicus* Cope. Anterior extremity of right dentary and parasphenoid. × 1⅛. Type; No. 2091.

Ichthyodectes acanthicus Cope 1877. (Fig. 39.)

Type 2091 Parasphenoid; fragment of dentary displaying three good teeth and roots of two others; one vertebra. *I. acanthicus* Cope, Proc. Amer. Philos. Soc. XVII, 1877, p. 177 . . Cope Coll.
Niobrara (Cretac.): Gove Co. (?) Kans.

Ichthyodectes anaides Cope 1872.

Niobrara (Cretaceous): Kansas.

Type 1939 Jaws, hyomandibular, quadrate; sclerotic; pectoral (?) fin-rays, pelvic fin-support; 30 vertebræ. *I. anaides* Cope, Proc. Amer. Philos. Soc. XII, 1872, p. 239; Cret. Vert. 1875, p. 206, pl. xlv, figs. 1–8. Smoky Hill River . . . . . . Cope Coll.

Paratype 1997	Both dentaries, fragments of fin-rays, 8 vertebræ. *Loc. cit.* 1875, p. 206. Smoky Hill River . . . . Cope Coll.
Figured 1611	Skull; a palatine which may not belong to this individual. *Portheus? arcuatus* Cope, Cret. Vert. 1875, p. 220 B, pl. xlvii, figs. 7–9 . . . . Cope Coll.
Figured 1628	Twenty-six vertebræ. *Loc. cit.* pl. xliv, fig. 14 . . . Cope Coll.
Figured 7356	Left maxilla. *I. anaides* Cope, Hay, Amer. Journ. Sci. [4], VI, 1898, p. 226, fig. 2 . . . . Hay Coll.

Ichthyodectes ctenodon Cope 1870.

Type 1910	Left maxilla and hinder three-fourths of right; most of one dentary, both quadrates, an anterior vertebra. *I. ctenodon* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 536; Cret. Vert. 1875, p. 207, pl. xlvi, figs. 1–4 . . . . Cope Coll. Niobrara (Cretac.): Smoky Hill R., Kans.

ICHTHYODECTES GOODEANUS Cope. See *Saurocephalus goodeanus* (Cope).

Ichthyodectes hamatus Cope 1872.

Type 1905	Jaws, vertebræ, fin-spines. *I. hamatus* Cope, Proc. Amer. Philos. Soc. XII, 1872, p. 340; Cret. Vert. 1875, p. 209, pl. xlvi, fig. 5 . . . . Cope Coll. Niobrara (Cretac.): Smoky Hill R., Kans.

Ichthyodectes multidentatus Cope 1872.

Type 2186	Premaxilla and distal end of maxilla. *I. multidentatus* Cope, Proc. Amer. Philos. Soc. XII, 1872, p. 342; Cret. Vert. 1875, p. 212, pl. l, figs. 6, 7 . . . . Cope Coll. Niobrara (Cretac.): Smoky Hill R., Kans.
Figured 1743	Cranium, maxilla with good teeth, shoulder-girdle, fin-ray. Cope's "second specimen," *loc. cit.* 1875, p. 212; Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 57, figs. 42, 43. Cope Coll. Niobrara (Cretac.): Solomon River, Kans.

ICHTHYODECTES PERNICIOSUS Cope. See *Protosphyræna perniciosa* (Cope), No. 1850.

Ichthyodectes prognathus (Cope) 1870.

Type 1912 Premaxilla and portions of maxilla, vertebræ, large fin-ray, base of caudal fin. *Saurocephalus prognathus* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 532; *Ichthyodectes prognathus* Cope, Cret. Vert. 1875, p. 210, pl. xlvi, figs. 6–10 . . . Cope Coll.
Niobrara (Cretac.): 6 miles S. of Sheridan, Kans.

Ichthyotringa tenuirostris Cope. See *Rhinellus tenuirostris* (Cope).
Ischypterus Egerton. See *Semionotus* Agassiz.
" minutus Newberry. See *Semionotus sp.* No. 677a.
" modestus " " " *elegans* (Newb.)
Nos. 550 and 593.

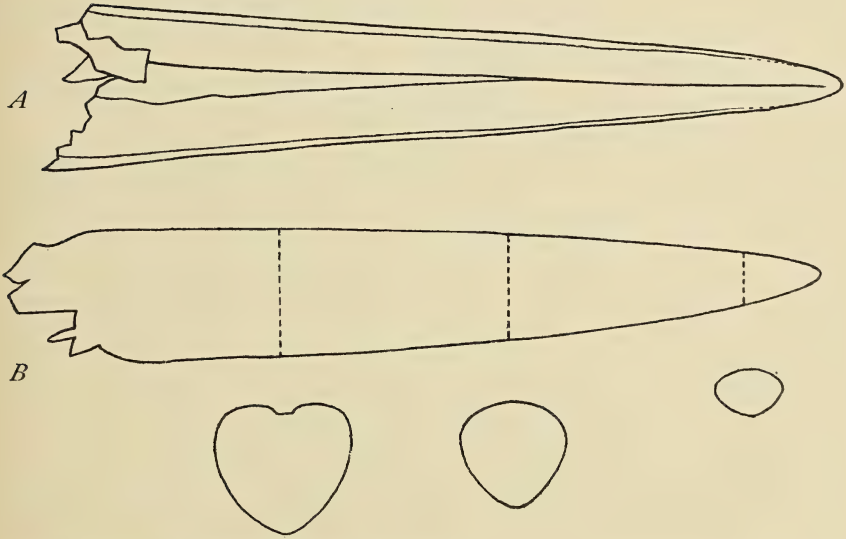

Fig. 40.— *Istiophorus robustus* (Leidy). Rostrum. × ¾. *A*, dorsal aspect; *B*, lateral aspect and transverse sections. Type; No. 5684.

Ischyrhiza mira Leidy 1856.

Type 3089 Two teeth. *I. mira* Leidy, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 221; Leidy, in F. S. Holmes, Post-Pleioc. Fos. S. Car. 1860, p. 120, pl. xxv, figs. 3–8.
Miocene? Ashley River, S. C.

Istiophorus robustus (Leidy) 1860. (Fig. 40.)

Type 5684 Rostrum and a fragment. *Xiphias robustus* Leidy, in F. S. Holmes, Post-Pleioc. Fos. S. Car. 1860, p. 119, pl. xxvii, figs. 3–5. The originals of figures 3 and 4 belong together.
Pleistocene? Ashley River, S. C.

Knightia[1] **alta** (Leidy) 1873.

Eocene: Green River, Wyo.

Figured 2686 One small fish, on shale. *Diplomystus altus* Leidy, Cope, Tert. Vert. 1884, p. 79, pl. ix, fig. 11 . . . . Cope Coll.

Figured 2688 Small fish on shale. Labeled by Cope *Clupea humilis* Leidy, but published as *Diplomystus altus* Leidy. Cope, *loc. cit.* p. 79, pl. ix, fig. 9 . . . . Cope Coll.

Figured 2791 Posterior half of small fish, on shale; labeled *Clupea humilis. Loc. cit.* p. 79, pl. ix, fig 10 . . . . Cope Coll.

Figured 2794 Slab of shale with many young fishes; partly figured. Labeled. "*Clupea humilis* fry," but published as *Diplomystus altus* — *loc. cit.* p. 79, pl. ix, fig. 12 . . . . Cope Coll.

Figured 2796 Small fish on shale labeled *Clupea pusilla* but published as *Diplomystus humilis. Loc. cit.* p. 77, pl. vi, fig. 3 . Cope Coll.

Lepisosteus atrox Leidy 1873.

Figured 2540 Three scales. *Clastes atrox* (Leidy), Cope, Tert. Vert. p. 54, pl. ii, figs. 47–49. . . . . Cope Coll.
Bridger (Eocene): Wyoming.

Lepisosteus cuneatus (Cope) 1884.

Type 2517 Nearly complete fish on block of limestone. *Clastes cuneatus* Cope, Tert. Vert. 1884, p. 55, pl. i, fig. 6 . . . . Cope Coll.
Manti beds (Eoc.): Central Utah.

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[1] The genus *Knightia* was proposed recently by President D. S. Jordan for a section of *Diplomystus* with *Diplomystus humilis* (Leidy) as the type species (Univ. of Cal. Publ. Bull. Dept. Geol. V, 1907, p. 136).

Lepisosteus nahunticus (Cope) 1869. (Fig. 41.)

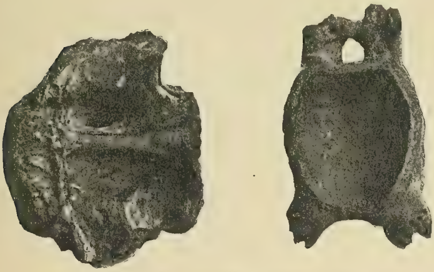

Fig. 41.— *Lepisosteus nahunticus* (Cope). Vertebra seen from lateral and posterior aspects; natural size. Type; No. 2559.

Type 2559 One opisthocœlus caudal vertebra and a fragment. *Pneumatosteus nahunticus* Cope, Proc. Amer. Philos. Soc. XI, 1869, p. 242. Cope Coll.
Miocene: Wayne Co., North Carolina.

Leptosomus lineatus (Cope) 1878.

Cotype 2511 Posterior half of a small fish on same block with Nos. 2510 and 2516. *Sardinius lineatus* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 71; *Leptosomus lineatus* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 92, pl. v, fig. 2. Cope Coll.
Niobrara (Cretac.): Yankton, S. Dak.

Cotype 2538 Anterior half of a small fish. Cope, *loc. cit.* p. 71. Hay, *loc. cit.* pl. iv, fig. 6 . . . . Cope Coll.
Niobrara (Cretac.): Yankton, S. Dak.

Leptosomus nasutulus (Cope) 1878.

Type 2512 Small fish. *Sardinius nasutulus* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 70; *Leptosomus nasutulus* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. IX, 1903, p. 90, pl. iv, fig. 4.
Niobrara (Cretac.): Yankton, S. Dak. Cope Coll.

Figured 2513 Small fish, on same block with type of *Sardinius ? imbellis* Hay. *L. nasutulus* (Cope), Hay, *loc. cit.* p. 91, pl. iv, fig. 5.
Niobrara (Cretac.): Yankton, S. Dak. Cope Coll.

Leptosomus percrassus (Cope) 1878.

Type 2510 Small fish on same block with Nos. 2511 and 2516. *Sardinius percrassus* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 72. *Leptosomus percrassus* (Cope), Hay, Bull. Amer. Mus. XIX, 1903, p. 92, pl. v, fig. 3 . . . . Cope Coll.
Niobrara (Cretac.): Yankton, S. Dak.

Leptotrachelus longipinnis Cope 1878.

Cotype 2520 Fish lacking both head and tail, showing dorsal and ventral fins. *L. longipinnis* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 68; Hay, Bull. Amer. Mus. XIX, 1903, p. 90, pl. iv, fig. 3.
Niorbara (Cretac.): Yankton, S. Dak. Cope Coll.

Cotype 2521 Head and trunk of distorted fish, on same block with type of *Leptosomus percrassus* (Cope). Hay, *loc. cit.* pl. v, fig. 4. Formation and locality as preceding . . . . . Cope Coll.

Leptotrachelus serpentinus Hay 1903.

Type 3683 Portion of a relatively large fish preserved from region of operculum to the caudal. Displays the operculum, vertebræ showing anterior and posterior processes, pectoral and ventral fins and arrow-head-shaped dermal scutes. *L. serpentinus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 419, pl. xxxii, fig. 1. Mt. Lebanon Coll.
Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Leptotrachelus virgulatus (Cope) 1878.

Type 2516 Fish lacking tail, on same block with type of *Leptosomus percrassus* (Cope). Displays cranium, vertebræ, pectoral and ventral fins. *Triœnaspis virgulatus* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 67. *Leptotrachelus virgulatus* (Cope), A. S. Woodward, Cat. Foss. Fishes Brit. Mus. IV, 1901, p. 187. *Triœnaspis virgulatus* Cope, Hay, Bull. Amer. Mus. XIX, 1903, p. 89, pl. v, fig. 1 . . . . Cope Coll.
Niorbara (Cretac.): Yankton, S. Dak.

Leuciscus reddingi (Cope) 1883. (Pl. V, figs. 1, 2.)

Cotypes 2767 Three toothed pharyngeals and some fragments. *Squalius reddingi* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 157. *Leuciscus reddingi* (Cope), Hay, Bibliogr. and Cat. Fos. Vert. p. 396 . . . . Cope Coll.
Pleistocene: S. Idaho.

Leucus condonianus Cope. See *Rutilus condonianus* (Cope).

Macrepistius arenatus Cope 1894.

Type 2435 Nearly complete fish, a porton of the body just behind the head missing. *M. arenatus* Cope, Journ. Acad. Nat. Sci. Phila. [2], IX, 1894, p. 441, pl. xix, figs. 2–2b . . . . Cope Coll.
Trinity beds (Cretac.): Glen Rose, Tex.

Mecolepis corrugatus Newberry. See *Haplolepis corrugata* (Newb.).
“ lineatus “ “ *Rhadinichthys ? lineatus* (Newb.).
“ ornatissimus “ “ *Haplolepis ornatissima* (Newb.).

Microcœlia dayi Hay 1903.

Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Type 3692 Fish 98 mm. long, showing all the fins. *M. dayi* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 430, pl. xxxiv, fig. 1. Mt. Lebanon Coll.

Paratype 3816 Fish lacking caudal region, showing fins, cranium, dentary, operculum, position of intestine and a row of modified scales in front of dorsal fin. *M. dayi* Hay, *loc. cit.* p. 431, pl. xxxi, fig. 3 . . . . Mt. Lebanon Coll.

Paratype 3677 A slenderer fish than the type. *Loc. cit.* p. 431. Mt. Lebanon Coll.

Paratype 3798 Fish 84 mm. long; head 21, depth 19. *Loc. cit.* p. 431. Mt. Lebanon Coll.

Paratype 3803 Fish 110 mm. long. *Loc. cit.* p. 431. . . . Mt. Lebanon Coll.

Mioplosus abbreviatus Cope 1877. (Fig. 42.)

Type 2463 Imperfectly-preserved fish, lacking anterior half of head and extremity of tail. *M. abbreviatus* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 813 . . . . Cope Coll.
Eocene: Twin Creek, Wyo.

Mioplosus labracoides Cope 1877.

Eocene: Twin Creek, Wyo.

Type 2457 Complete fish. One of three specimens labeled in Cope's handwriting *Type. M. labracoides* Cope. Bull. U. S. Geol. Surv. Terr. III, 1877, p. 814; Tert. Vert. 1884, p. 89, pl. xii, fig. 1. Cope Coll.

Paratype 2458 Nearly complete fish. *Loc. cit.* 1877, p. 814 . . . Cope Coll.

Paratype 2459 Imperfectly-preserved fish. *Loc. cit.* 1877, p. 814 . Cope Coll.

Mylocyprinus inflexus Cope 1883. (Pl. V, figs. 11, 12.)

Type 2741 Two pharyngeals bearing teeth. *M. inflexus* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 154 . . . . Cope Coll.
Pleistocene: Near Sinker Creek, Idaho.

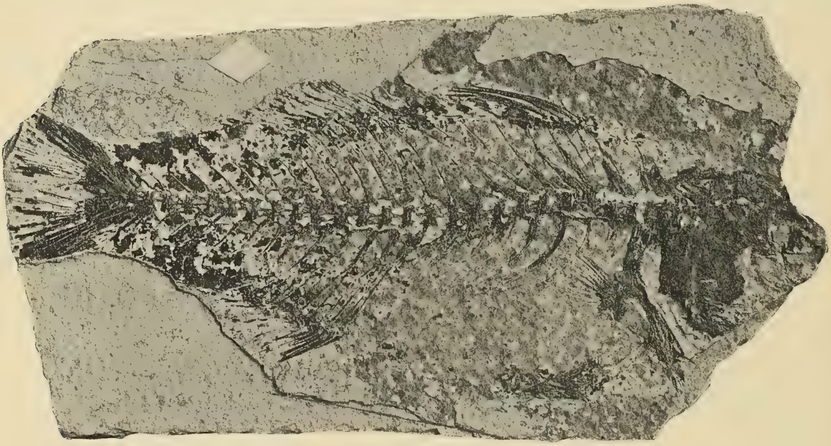

Fig. 42.— *Mioplosus abbreviatus* Cope. Type. No. 2463. × $\frac{3}{5}$.

Mylocyprinus robustus Leidy 1870. (Pl. V, figs. 9, 10.)

Type 7529 5 imperfect pharyngeals and two fragments. *M. robustus* Leidy, Proc. Acad. Nat. Sci. Phila. XXI, 1870, p. 70.
Pleistocene: Castle Creek, Idaho.

Nematonotus longispinus (Davis) 1887.

Figured 3678 Well-preserved fish lacking caudal. One very long dorsal ray; pectoral fin also long. *N. longispinus* (Davis), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 428 pl. xxxiv, fig. 2.
Mt. Lebanon Coll.
Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Figured 3723 Large fish 165 mm. long. *Loc. cit.* pl. xxxv. Formation and locality as preceding . . . . Mt. Lebanon Coll.

Notogoneus osculus Cope 1885.

Eocene: Twin Creek, Wyo.

Cotype 2503 — Fish on slab of shale, in side view. Displays all fins, the ventral fin-supports, bones of top of cranium and of operculum; 50 vertebræ present and about 2 or 3 missing. *N. osculus* Cope, Amer. Natural. XIX, 1885, p. 1091; Mem. Natl. Acad. Sci. III, 1886, p. 163, pl. iv . . . . Cope Coll.

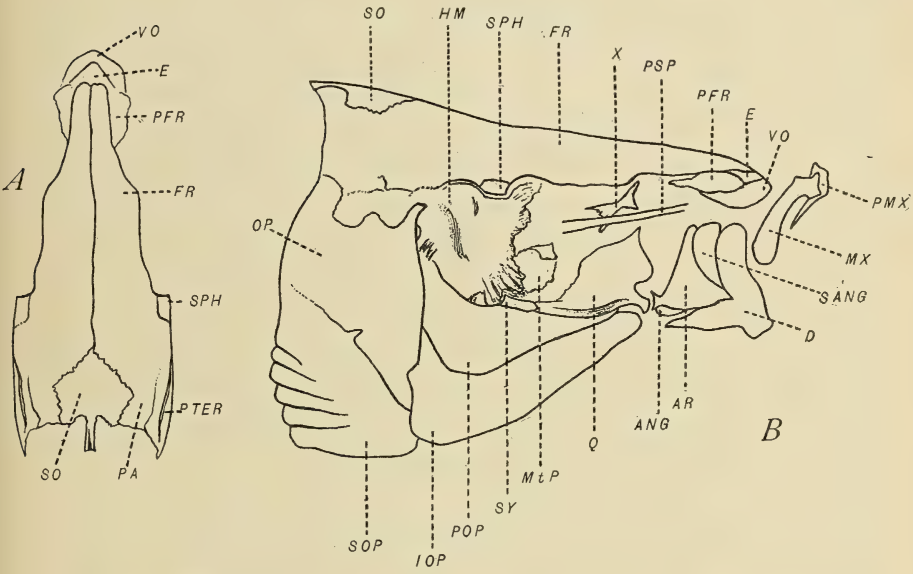

Fig. 43.— *Notogoneus osculus* Cope. Dorsal (*A*), and lateral (*B*), views of cranium, based on three specimens (No's. 2503, 2504 and 5583) in the American Museum collections. $\times\frac{5}{8}$. *ANG*, angular; *AR*, articular; *D*, dentary; *E*, ethmoid; *FR*, frontal; *HM*, hyomandibular; *IOP*, interoperculum; *MtP*, metapterygoid; *MX*, maxilla; *OP*, operculum; *PA*, parietal; *PFR*, prefrontal; *PMX*, premaxilla; *POP*, preoperculum; *PSP*, parasphenoid; *PTER*, pterotic; *Q*, quadrate; *SANG*, surangular; *SO*, supraoccipital; *SOP*, suboperculum; *SPH*, sphenotic; *SY*, symplectic; *VO*, vomer; *X*, cheek-plate.

Cotype 2504 — Fish in side view, lacking caudal. *Loc. cit.* 1885, p. 1091.

Figured $\frac{5583}{1}$ — Well-preserved fish in lateral view. Displays well all the fins, bones of cranium and jaw. Type of *Protocatostomus constablei* Whitfield, Bull. Amer. Mus. Nat. Hist. III, 1890, p. 120, pl. iv, figs. 1–5. *Notogoneus osculus* Cope, A. S. Woodward, Cat. Fos. Fishes Brit. Mus. IV, 1901, p. 275.

Notropis angustarcus (Cope) 1878. (Pl. V, figs. 3, 4.)

Type 2636 — 2 Pharyngeals bearing teeth. *Alburnops angustarcus* Cope, Proc. Amer. Philos. Soc. XVII, 1878, p. 230; *Cliola angustarca* (Cope), Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 142, *Notropis angustarcus* (Cope), Hay, Bibl. and Cat. Fos. Vert. 1902, p. 396 . . . . Cope Coll.
Pleistocene: Silver Lake, Oregon.

Oricardinus sheareri (Cope) 1872.

Type 1998 — Incomplete maxilla (?). *Pachyrhizodus sheareri* Cope, Proc. Amer. Philos. Soc. XII, 1872, p. 347; *Oricardinus sheareri* (Cope), Proc. Amer. Philos. Soc. XVII, 1877, p. 177; *O. sheareri* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 64, fig. 46 . . . . Cope Coll.
Niobrara (Cretac.): Fossil Spring, Kans.

Oricardinus tortus Cope 1877.

Type 2114 — Left dentary, incomplete at posterior end; about 35 vertebræ from different regions of body. *O. tortus* Cope, Proc. Amer. Philos. Soc. XVII, 1877, p. 177; Hay, Bull. Amer. Mus. XIX, 1903, p. 65, figs. 47–49 . . . . Cope Coll.
Niobrara (Cretac.): Gove Co., Kans.

Osmeroides ornatus Hay. See *Sardinioides ornatus* (Hay).

Osmeroides pontivagus Hay 1903.

Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Type 3845 — Complete fish, 60 mm. long. *O. pontivagus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 424, pl. xxxiii, fig. 2. Mt. Lebanon Coll.

Paratype 3846 — Complete fish, 64 mm. long. *Loc. cit.* pl. xxxiii, fig. 1. Mt. Lebanon Coll.

Paratype 3855 — Well-preserved fish, body not as deep as in the type. *Loc. cit.* p. 425, pl. xxxiii, fig. 3 . . . . Mt. Lebanon Coll.

Paratype 3841 — Complete fish 70 mm., head not well preserved. Counterpart. *Loc. cit.* p. 425, pl. xxxiii, fig. 4 . . . . Mt. Lebanon Coll.

Osteoglossum encaustum Cope. See *Phareodus encaustus* (Cope).

Pachyrhizodus caninus Cope 1872.

Niobrara (Cretaceous): Kansas.

Type 1881 Both mandibles, right maxilla, right premaxilla and fragment of left; fragments. Represent perhaps two individuals (Cope). *P. caninus* Cope, Proc. Acad. Philos. Soc. XII, 1872, p. 344; Cret. Vert. 1875, p. 221, pl. l, figs. 1–4. Near Fort Wallace. Cope Coll.

Figured 1658 One lobe of caudal fin with large jointed rays. *P. caninus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 63, pl. iii, fig. 2. Gove Co. . . . . Cope Coll.

Figured 1662 A pair of large well-preserved mandibles and some fragments. Hay, *loc. cit.* p. 61, fig. 44. Gove Co. . . . . Cope Coll.

Figured 1758 Distal half of left mandible and proximal half of right; supposed preorbital, hyomandibular and interopercular bones. Types of *Pachyrhizodus latimentum* Cope — Proc. Amer. Philos. Soc. XII, 1872, p. 346; Cret. Vert. 1875, p. 223, pl. li, figs. 1–2, 4 and 5. (Originals of figs. 3, 6 and 7 not found). *P. caninus* Cope, Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 60, Solomon River . . . . Cope Coll.

Figured 1900 Caudal fin attached to some of hindermost vertebræ. *P. caninus* Cope, Hay, *loc. cit.* p. 63, pl. iii, fig. 1. Gove. Co. Cope Coll.

Figured 1903 Thirteen large vertebræ, three figured — as *Anogmius.* Cope, Cret. Vert. 1875, pl. xlvi, fig. 12. Smoky Hill River. Cope Coll.

PACHYRHIZODUS LATIMENTUM Cope. See *P. caninus* Cope No. 1758.

PALÆONISCUS LATUS (J. H. Redf.), L. P. Gratacap. See *Semionotus brauni* (Newberry).

Pachyrhizodus leptopsis Cope 1874.

Type 1756 Distal half of right mandible and a fragment from proximal part. *P. leptopsis* Cope, Bull. U. S. Geol. Surv. Terr. I ser. No. 2. p. 42; Cret. Vert. 1875, p. 225, pl. li, figs. 8a, 8b . Cope Coll. Niobrara (Cretac.): Kansas.

PACHYRHIZODUS SHEARERI Cope. See *Oricardinus sheareri* (Cope).

Pappichthys lævis Cope 1873.

Type 2570 Several fragments belonging to the type specimen. Labeled *Type* in Cope's handwriting. The figured portion of the type is in the U. S. National Mus.— Cat. No. 3968 (Bull. U. S. Natl. Mus. No. 53, part II, 1907, p. 14) . . . . . . Cope Coll.
Bridger (Eocene): Cottonwood Creek, Wyo.

Pappichthys plicatus Cope 1873.

Cotype[1] 2539 Distal portions of left maxilla and left dentary; left quadrate, two fragments of cranial bones and 3 incomplete vertebræ. *P. plicatus* Cope, 6th Ann. Rept. U. S. Geol. Surv. 1873, p. 635; Tert. Vert. 1884, p. 59, pl. iii, figs. 12–18 . . . Cope Coll.
Bridger (Eocene): Cottonwood Creek, Wyo.

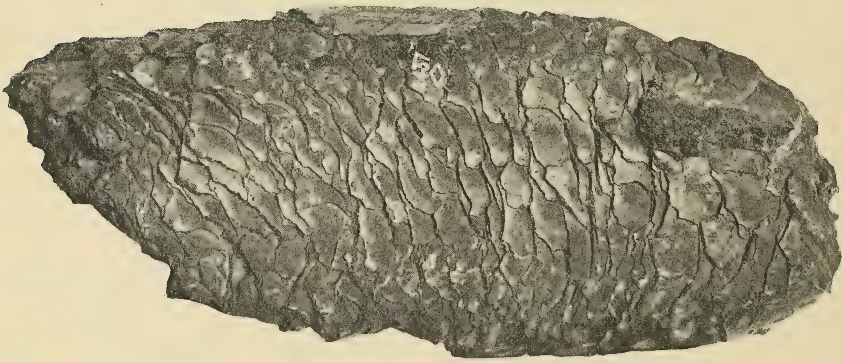

Fig. 44.— *Pelecorapis berycinus* Cope. Portion of trunk covered with scales. × about $\frac{4}{7}$. Type; No. 2437.

PELELCOPTERUS CHIRURGUS Cope. See *Protosphyræna nitida* (Cope) Nos. 1609 and 1894.

PELELCOPTERUS GLADIUS (Cope). See *Protosphyræna gladius* (Cope).

Pelecorapis berycinus Cope 1877. (Fig. 44.)

Type 2437 Portion of trunk of a fish, covered with scales; chalcedonized. *P. berycinus* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 587.
Ft. Pierre (Cretaceous): Montana. Cope Coll.

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[1] The second of the two cotypes is in the U. S. National Mus., Catal. No. 3958. *Cf.* Bull. U. S. Natl. Mus. No. 53, Part II, 1907, p. 14.

Pelecorapis varius Cope 1874.

Type Four fragments of shale containing impressions of vertebræ, ribs,
2065 scales, etc. *P. varius* Cope, Bull. U. S. Geol. Surv. Terr. I ser.
No. 2, p. 39 . . . . Cope Coll.
Benton (Cretaceous): W. of Sibley, Kans.

Phareodus æquipinnis (Cope) 1878.

Cotype[1] Small fish 92 mm. long not well preserved. Cope's specimen "No.
2473 2." *Dapedoglossus æquipinnis* Cope, Bull. U. S. Geol. Surv.
Terr. IV, 1878, p. 77; Tert. Vert. 1884, p. 73, pl. vii, fig. 3.
Eocene: Twin Creek, Wyo. Cope Coll.

Phareodus encaustus (Cope) 1871.

Type Fragment of shale covered with large scales. This is the first
2793 specimen of *Phareodus* known to Cope (Tert. Vert. 1884, p.
69). *Osteoglossum encaustum* Cope, Ann. Rept. U. S. Geol.
Surv. Terr. 1870 (1871), p. 430; *Dapedoglossus encaustus* Cope,
Tert. Vert. 1884, p. 70, pl. vi, fig. 1 . . . . . Cope Coll.
Eocene: Green River, Wyo.

Phasganodus gentryi Cope. See *Enchodus gentryi* (Cope).

Platysomus circularis Newberry and Worthen 1870.

Cotype? Small fish in phosphate nodule, labeled *Type* in Newberry's hand-
520 writing; but is not the specimen figured. *P. circularis* N. and
W. Geol. Surv. Illinois IV, 1870, p. 347 . . Newb. Coll.
Coal Measures: Mazon Creek, Ill.

Platysomus lacovianus Cope 1891.

Type Small fish 37 mm. long in phosphate nodule. *P. lacovianus*
7400a Cope, Proc. U. S. Natl. Mus. XIV, 1891, p. 462, pl. xxxi, fig.
7400b 11 . . . . Cope Coll.
Coal Measures: Mazon Creek, Ill.

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[1] Specimen "No. 1" is in the U. S. National Mus., Cat. No. 4003 (Bull. U. S. Natl. Mus. No. 53, part II, 1907, p. 9).

Platysomus palmaris Cope 1891.

Type 7281 Many fragments covered with scales; a few fragmentary bones. *P. palmaris* Cope, Proc. U. S. Natl. Mus. XIV, 1891, p. 460, pl. xxxiii, fig. 10 . . . . Cope Coll.
Permian: Indian Territory.

PNEUMATOSTEUS NAHUNTICUS Cope. See *Lepisosteus nahunticus* (Cope).

Pogonias multidentatus Cope 1869. (Pl. V, fig. 13.)

Type 2247 Left superior pharyngeal. *P. multidentatus* Cope, Proc. Bost. Soc. Nat. Hist. XII, 1869, p. 310 . . . . . Cope Coll.
Miocene: Nomini, Westmoreland Co., Va.

PORTHEUS ANGULATUS Cope. See *Protosphyræna ? angulata* (Cope).
" ? ARCUATUS Cope. See *Ichthyodectes anaides* Cope No. 1611.
" GLADIUS Cope. See *Protosphyræna gladius* (Cope) No. 1849.

Portheus lestrio Cope 1873.

Figured 1603 Left maxilla and premaxilla, the latter lacking the large laniary teeth; bones in front of orbit, including the prefrontal, palatine and half of the ossified sclerotic; three vertebræ. *P. lestrio* Cope, Cret. Vert. 1875, p. 202, pl. xlii, fig. 1. Also specimen figured on pl. xlvii, fig. 1 . . . . Cope Coll.
Niobrara (Cretac.): Trego Co., Kans.

Portheus molossus Cope 1871.

Niobrara (Cretaceous): Kansas.

Type 1665 Imperfectly-preserved cranium, right maxilla and premaxilla, left dentary. *P. molossus* Cope, Proc. Amer. Philos. Soc. XII, 1871, p. 175; Cret. Vert. 1875, p. 194, pl. xxxix. Wallace Co. . . . . Cope Coll.

Figured 993 Almost complete fish on slab of chalk. Total length 4775 mm., length of cranium, 660 mm., spread of tail 1106 mm. *P. molossus* Cope, Osborn, Bull. Amer. Mus. Nat. Hist. XX, 1904, p. 377, pl. x, also p. 378, figs. 1, 3. Logan Co. Purchased.

Figured 7318 Large cranium on slab of chalk, displaying most of the skull elements of the left side. Osborn, *loc. cit.* p. 379, fig. 2. (Fig. 45.)

Figured 7296 "Pelvis" and pelvic fins (in part). Osborn, *loc. cit.* p. 381, fig. 4 . . . . Hay Coll.

Figured 1732 Complete skull and jaws. *P. molossus* Cope, Cret. Vert. 1875, pp. 196, 184, fig. 8 . . . . Cope Coll.

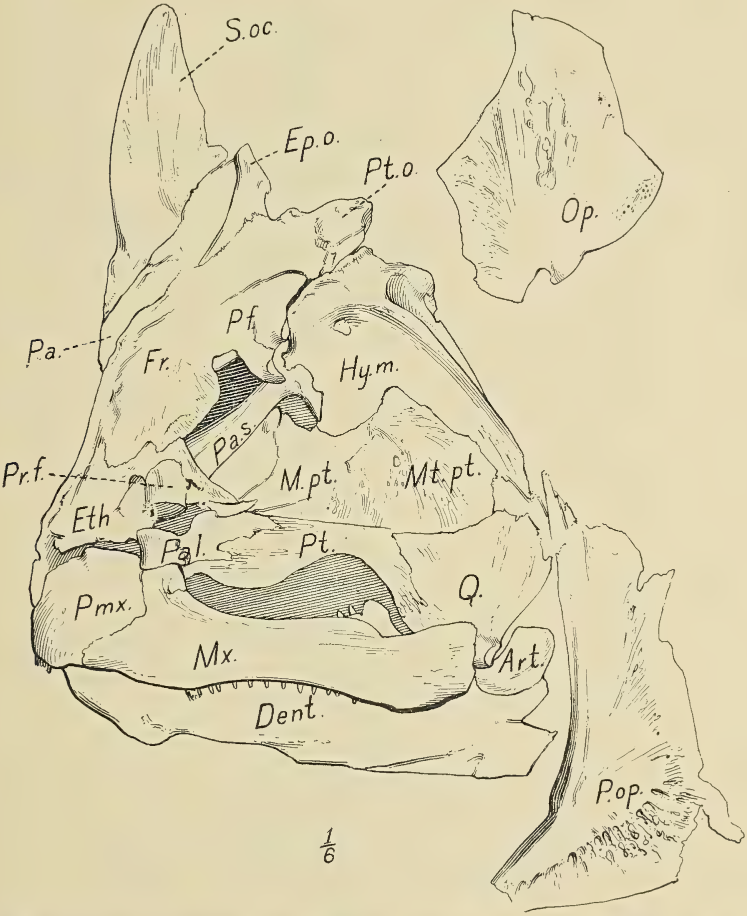

Fig. 45.—*Portheus molossus* Cope. Cranium from left side. No. 7318. *Art.*, articular; *Dent.*, dentary; *Ep. o.*, epiotic; *Eth.*, ethmoid; *Fr.*, frontal; *Hy. m.*, hyomandibular; *M. pt.*, mesopterygoid; *Mt. Pt.*, metapterygoid; *Mx.*, maxilla; *Op.*, operculum; *Pa.*, parietal; *Pal.*, palatine; *Pa. s.*, parasphenoid; *Pf.*, postfrontal; *Pmx.*, premaxilla; *P. op.*, preoperculum; *Prf.*, prefrontal; *Pt.*, pterygoid; *Pt. o.*, postorbital; *Q.*, quadrate: *S. oc.*, supraoccipital. (From H. F. Osborn.)

Portheus thaumas (Cope) 1870.

Type 1682 Part of type. Some rays of pectoral fin; caudal vertebræ with hæmal and neural spines. *Saurocephalus thaumas* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 533; *Portheus molossus* (Cope), Cret. Vert. 1875, p. 196, pl. xliv, figs. 2, 4. Cope Coll.

Niobrara (Cretac.): Solomon River, Kans.

Figured 7350	Well-preserved right maxilla with nearly all teeth present. Figured to show condyles. Hay, Zool. Bull. II, 1898, p. 34, fig. 2. Western Kansas . . . . Hay Coll.

Portheus sp.

Niobrara (Cretaceous): Kansas.

Figured 1683	Proximal parts of three pectoral rays and some fragments. Cope, Tert. Vert. 1875, pl. xliv, figs. 6–8a . . . . . . Cope Coll.
Figured 1684	Scapula and incomplete pectoral fin. *Loc. cit.* pl. xlii, fig. 4. Cope Coll.
Figured 7360	Both halves of shoulder girdle on block of shale. Hay, Zool. Bull. II, 1898, p. 43, fig. 9 . . . . Hay Coll.
Figured 7342	Fragment of mandible dissected to show roots of teeth. Hay, *loc. cit.* p. 36, fig. 4 . . . . Hay Coll.
Figured 7388	Three neural arches from near the cranium; one figured. Hay, *loc. cit.* p. 51, figs. 15, 16 . . . . Hay Coll.

Priscacara hypsacantha Cope 1886.

Type 2453	Small fish. *P. hypsacanthus* Cope, Mem. Natl. Acad. Sci. III, 1886, p. 164, pl. i, fig. 6 . . . . Cope Coll. Eocene: No record.

Priscacara liops Cope 1877.

Paratype 2464	Imperfectly-preserved fish lacking caudal and greater part of head. *P. liops* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 818. Eocene: Twin Creek, Wyo. . Cope Coll.

Priscacara oxyprion Cope 1878.

Type[1] 2446	Well-preserved fish. *P. oxyprion* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 74; Tert. Vert. 1884, p. 94 . Cope Coll. Eocene: Twin Creek, Wyo.

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[1] Two other specimens (Nos. 2447 and 2448) of this species are in the Cope collection bearing labels in Cope's hand similar to that of the type. They are probably paratypes.

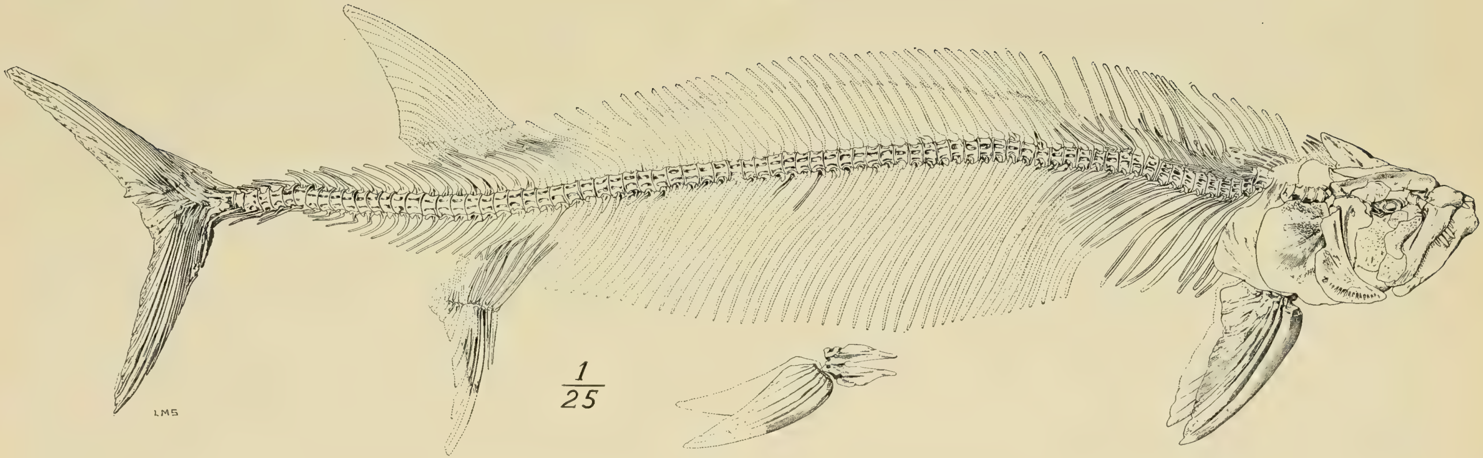

Fig. 46.— *Portheus molossus* Cope. Preliminary restoration based on specimen No. 993. (From H. F. Osborn.)

Priscacara serrata Cope 1877.

Eocene: Twin Creek, Wyo.

Type 2440 Fish imperfectly-preserved in snout and caudal regions, labeled by Cope "Myloplites serratus Cope type." *P. serrata* Cope, Bull. U. S. Geol. Surv. Terr. III 1877, p. 816; Tert. Vert. 1884, p. 93 . . . . Cope Coll.

Paratype 2441 Well-preserved fish showing the row of scales along the postero-inferior edge of the operculum. Cope, *loc. cit.* 1877, p. 817. Cope Coll.

Paratype 2442 Well-preserved fish. *Loc. cit.* 1884, pl. xiii, fig. 1. Cope Coll.

Priscacara testudinaria Cope 1884.

Type 2444 Fish lacking head, pectoral and ventral fins; on shale. *P. testudinaria* Cope, Tert. Vert. 1884, p. 98, pl. i, fig. 7 . Cope Coll.
Manti (Eocene): Manti, Utah.

Protocatostomus Whitfield. See *Notogoneus* Cope.

Protosphyræna ? angulata (Cope) 1872. (Fig. 47.)

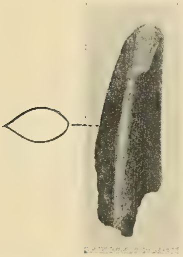

Fig. 47.— *Protosphyræna?* *angulata* (Cope). Crown of tooth; natural size. Type? No. 2863.

Type? 2863 Distal part of a large tooth. Agrees with Cope's description. *Portheus angulatus* Cope, Proc. Amer. Philos. Soc. XII, 1872, p. 337. *Protosphyræna angulata* (Cope), Hay, Bibl. and Catal. Fos. Vert. 1902, p. 379 . . . . . . Cope Coll.
Cretaceous: Duplin Co., N. Car.

Protosphyræna dimidiata (Cope) 1877.

Type 1635 Fragmentary jaws and the ethmoid. *Erisichthe nitida* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 822; *E. dimidiata* Cope, Proc. Amer. Assoc. Adv. Sci. XXVI, 1878, p. 300; *Protosphyræa dimidiata* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 16, figs. 8–10. The vertebra (figs. 11 and 12) not found by present writer . . . . Cope Coll.
Niobrara (Cretac.): Gove Co., Kans.

Protosphyræna gladius (Cope) 1873.

Type Large pectoral fin-blade and some fragments of cranial bones.
1849 *Portheus gladius* Cope, Proc. Acad. Nat. Sci. Phila. XXIV, 1873, p. 338; *Pelecopterus gladius* (Cope), Cret. Vert. 1875, p. 244 E, pl. lii, fig. 3. *Protosphyræna gladius* (Cope), Hay, Bull. Amer. Mus. XIX, 1903, p. 24 . . . . . . Cope Coll.
Niobrara (Cretac.): Solomon River, Kans.

Figured Fragments of pectoral fin-blade, Cope, *loc. cit.* 1875, p. 244 F,
2064 pl. xliv, fig. 12 . . . . Cope Coll.
Niobrara (Cretac.): Fossil Spring Cañon, Kans.

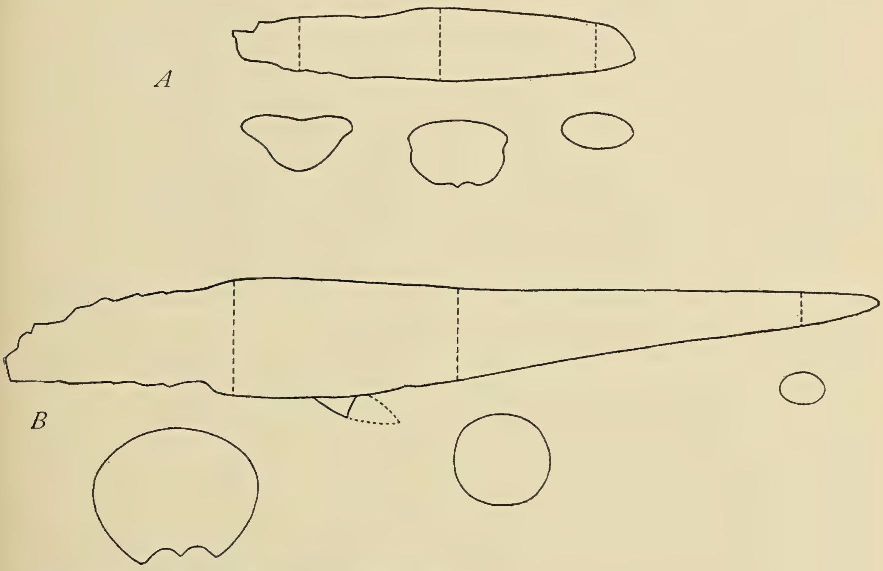

Fig. 48.— Outlines of Rostra of *Protosphyræna.*

A, *P. ziphioides* (Cope). Lateral aspect and transverse sections. × ½. Type; No. 2131.
B, *P. nitida* (Cope). Lateral aspect and transverse sections. × ½. No. 1871.

Protosphyræna nitida (Cope) 1872. (Fig. 48, *B*.)

Niobrara (Cretaceous): Kansas.

Type Both premaxillæ, fragment of dentary and of maxilla, hyomandi-
1893 bular, and the undetermined bone figured by Cope (fig. 7). *Erisichthe nitida* Cope, Proc. Acad. Nat. Sci. Phila. XXIII, 1872, p. 280; Cret. Vert. 1875, p. 217, pl. xlviii, figs. 3–8. *Protosphyræna nitida* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 3. Phillips. Co. . . . . . . Cope Coll.

Figured 1609 Scapula. Paratype of *Pelecopterus chirurgus* Cope.— Cret. Vert. 1875, p. 244 E, pl. liv, fig. 9. *Protosphyræna nitida* (Cope), Hay, Bull. Amer. Mus. XIX, 1903, p. 8 . Cope Coll.

Figured 1894 Base of pectoral fin and part of shoulder-girdle. Type of *Pelecopterus chirurgus* Cope, Cret. Vert. 1875, p. 244 E, pl. xlviii, fig. 1. *Protosphyræna nitida* (Cope), Hay, *loc. cit.* p. 8. Solomon River . . . . Cope Coll.

Figured 2105 Rostrum. Type of *Erisichthe penetrans* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 822. *Protosphyræna nitida* (Cope), Hay, *loc. cit.* p. 5, figs. 1, 2. Gove Co. . . . Cope Coll.

Figured 2121 Rostrum, anterior portion of left dentary, splenial displaying good teeth, several fragments of other jaw elements, fragments of pectoral fin-blade. Hay, *loc. cit.* p. 7, fig. 3. Gove Co. Cope Coll.

Protosphyræna perniciosa (Cope) 1874.

Niobrara (Cretac.): Kansas.

Type 1850 Part of pectoral spine. *Ichthyodectes perniciosus* Cope, Bull. U. S. Geol. Surv. Terr. I ser. No. 2, 1874, p. 41; *Pelecopterus perniciosus* (Cope), Cret. Vert. 1875, p. 244 D, pl. lii, fig. 2. *Protosphyræna perniciosa* (Cope) Hay, Bull. Amer. Mus. XIX, 1903, p. 9. Solomon River . . . . Cope Coll.

Figured 1895 Base of pectoral fin; baseosts. Cope, *loc. cit.* 1875, p. 244 D, pl. xlviii, fig. 2; Hay *loc. cit.* p. 9. Solomon River? Cope Coll.

Figured 1901 Pectoral fin-blade and shoulder-girdle. Hay *loc. cit.* p. 11, figs. 4, 5.

Figured 2009 Both pectoral fin-blades, both clavicles, fin articulation of left side. Hay *loc. cit.* p. 13, fig. 7. Spring Creek, Rooks Co. Cope Coll.

Protosphyræna tenuis Loomis 1900.

Figured 205 Pectoral fin. *P. tenuis* Loomis, Hay *loc. cit.* p. 14, pl. i, fig. 2. Niobrara (Cretac.): Butte Creek, Logan Co., Kans.

Figured 1620 Distal portion of a pectoral fin and fragments of fin-rays. Hay *loc. cit.* p. 16, pl. i, fig. 3. Gove Co. . . . . . . Cope Coll.

Figured 2061 Portion of pectoral fin. *Pelecopterus perniciosus* Cope, Cret. Vert. 1875, pl. xliv, fig. 13. *Protosphyræna tenuis?* Loomis, Hay in card catal. Amer. Mus. Dept. Pal. . . . Cope Coll.

Protosphyræna ziphioides (Cope) 1877. (Fig. 48, *A*.)

Type 2131 Rostrum. *Erisichthe ziphioides* Cope, Bull. U. S. Geol. Surv. Terr. III, 1877, p. 823; *Protosphyræna ziphioides* (Cope), E. T. Newton, Quart. Journ. Geol. Soc. XXXIV, 1878, p. 795; *P. ziphioides* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 22, figs. 13, 14 . . . . Cope Coll.
Niobrara (Cretac.): Gove Co., Kans.

Protosphyræna sp.

Figured 1646 Base of pectoral fin articulated to baseosts. Hay, *loc. cit.* p. 13, fig. 6.

Ptycholepis marshi Newberry 1878. (Pl. VI.)

Type 575 Entire fish on shale. *P. marshi* Newberry, Annals N. Y. Acad. Sci. I, 1878, p. 127; Mon. U. S. Geol. Surv. XIV, 1888, p. 66.
Triassic: Durham, Conn. Newb. Coll.

Figured 669 Entire fish on shale. Newberry *loc. cit.* p. 66, pl. xix, figs. 2, 2a.
Formation and locality same as preceding . . . Newb. Coll.

Pycnosterinx levispinosus Hay 1903.

Type 3671 "Small fish, showing well the generic and specific characters" (O. P. Hay in card cat.). *P. levispinosus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 444, pl. xxxvi, fig. 4.
Mt. Lebanon Coll.
Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Rhadinichthys? lineatus (Newberry) 1856.

Type 454 Small fish lacking tail; on coal. *Mecolepis lineatus* Newberry, Proc. Acad. Nat. Sci. Phila. VIII, 1856, p. 97; *Eurylepis lineatus* (Newb.) Rept. Geol. Surv. Ohio Pal. I, 1873, p. 353, pl. xxxix, fig. 7. *Rhadinichthys? lineatus* (Newb.), Paleoz. Fishes N. Amer. 1889, p. 228 . . . . Newb. Coll.
Coal Measures: Linton, Ohio.

Rhinellus tenuirostris (Cope) 1878.

Type 2514 Head and upper part of anterior half of body. Displays the snout, some vertebræ, the dorsal fin, scales. *Ichthyotringa*

tenuirostris Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 69; *Rhinellus tenuirostris* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 94, pl. iv, fig. 7 . . . . Cope Coll.
Niobrara (Cretac.): Yankton, S. Dak.

Figured 2515 Head and anterior portion of body, with pectoral and ventral fins; on reverse side of block bearing the type. Hay, *loc. cit.* pl. iv, fig. 8. Formation and locality as preceding . Cope Coll.

Rutilus condonianus (Cope) 1883. (Pl. V, figs. 7, 8.)

Cotype 2756 One toothed pharyngeal and fragments of a second. *Leucus condonianus* Cope, Proc. Acad. Nat. Sci. Phila. XXXIV, 1883, p. 156. *Rutilus condonianus* (Cope), Hay, Bibl. and Catal. Fos. Vert. 1902, p. 395 . . . . Cope Coll.
Equus beds (Pleistocene): Southeast Oregon.

Cotype 2762 Two pharyngeals with teeth. *Loc. cit.*
Equus beds (Pleistocene): Silver Lake, Oregon. Cope Coll.

Sardinioides ornatus (Hay) 1903.

Type 3870 Small fish 48 mm. in total length. *Osmeroides ornatus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 426, pl. xxxiii, fig. 5. Catalogued by Dr. Hay (subsequent to publication) as *Sardinioides ornatus* in card catalog of the Amer. Mus. Dept. Pal. Mt. Lebanon Coll.
Upper Cretaceous: Hakel, Mt. Lebanon, Syria.

Sardinius? imbellis Hay 1903.

Type 2550 Small fish lacking head and the portion of body above the backbone; on block with *Leptosomus nasutulus* Cope (2513). On reverse side of same block is the paratype (No. 2549) consisting of the hinder half of a small fish. *Sardinius? imbellis* Hay, Bull. Amer. Mus. XIX, 1903, p. 93, pl. iv, fig. 9. Cope Coll.
Niobrara (Cretac.): Yankton, S. Dak.

SARDINIUS LINEATUS Cope. See *Leptosomus lineatus* (Cope).
" NASUTULUS " " " *nasutulus* "
" PERCRASSUS " " " *percrassus* "
SAUROCEPHALUS ARAPAHOVIUS Cope. See *S. lanciformis* Harlan.

Saurocephalus goodeanus (Cope) 1877. (Fig. 49.)

Type 2110 Premaxilla, maxilla, palatine and supramaxilla, all of the right side. *Ichthyodectes goodeanus* Cope, Proc. Amer. Philos. Soc. XVII, 1877, p. 176; *Saurocephalus goodeanus* (Cope), Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 52, fig. 41.
Niobrara (Cretac.): Gove Co., Kans. Cope Coll.

Saurocephalus lanciformis Harlan 1824.

Figured 2073 Fragment of maxilla with teeth. Type of *S. arapahovius* Cope, Cret. Vert. 1875, p. 216, pl. xlix, fig. 5; *S. lanciformis* Harlan, Hay, Bull. Amer. Mus. XIX, 1903, p. 51 . . Cope Coll.
Niobrara (Cretac.): S. of Wallace, Kans.

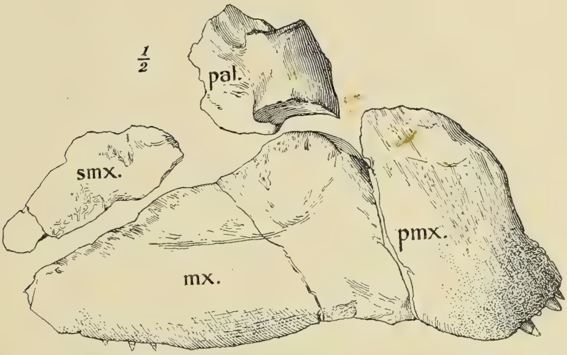

Fig. 49.— *Saurocephalus goodeanus* (Cope). Upper jaw, outer view. Type; No. 2110. *mx.*, maxilla; *pal.*, palatine; *pmx.*, premaxilla; *smx.*, supramaxilla. (From O. P. Hay.)

Figured 7373 Both mandibles, the palato-pterygoid arch of the left side and a fragment of a maxilla. *S. lanciformis* Harlan, Hay, Amer. Journ. Sci. [4], VII, 1899, p. 301, figs. 1, 2, 3 . Hay Coll.
Niobrara (Cretac.): Kansas.

Saurocephalus pamphagus Hay 1899.

Type 7355 Right maxilla and portions of left; palatine, both quadrates; one vertebra. *S. pamphagus* Hay, Amer. Journ. Sci. [4], VII, 1899, p. 303, figs. 4, 5 . . . . Hay Coll.
Niobrara (Cretac.): Butte Creek, Kans.

Saurocephalus phlebotomus Cope 1870.

Type 1906 Maxillæ, imperfectly preserved, and portions of both dentaries; malleoli of palatines. *S. phlebotomus* Cope, Proc. Amer. Philos. Soc. XI, 1870, p. 530. *Daptinus phlebotomus* Cope, Cret. Vert. 1875, p. 213, pl. xlix, figs. 1–4. *Saurocephalus phlebotomus* Cope, Hay, Bull. Amer. Mus. XIX, 1903, p. 49.
Niobrara (Cretac.): Solomon River, Kans. Cope Coll.

Figured 1907 Premaxilla, fragments of maxillæ and dentaries, predentary, palatine, quadrate, three vertebræ, part of caudal fin. Identified by Cope. *Daptinus phlebotomus* Cope, Cret. Vert. 1875, p. 214, pl. xlvii, fig. 6. *Saurocephalus phlebotomus* Cope, Hay, *loc. cit.* p. 49, fig. 38 . . . . Cope Coll.
Niobrara (Cretac.): Phillips Co., Kans.

Saurocephalus prognathus Cope. See *Ichthyodectes prognathus* (Cope).
" thaumas " " *Portheus thaumas* "

Saurocephalus xiphirostris (Stewart) 1898.

Figured 1614 Upper and lower jaws complete, predentary, quadrate, palatine. The premaxilla bears ten teeth. *S. xiphirostris* (Stewart), Hay, Bull. Amer. Mus. XIX, 1903, p. 51, figs. 39, 40.
Niobrara (Cretac.): Gove Co., Kans. Cope Coll.

Saurocephalid indet.

Figured 1606 Front portion of crushed skull displaying the ethmoid, vomer and palatine. Cope, Cret. Vert. 1875, pl. xlvii, fig. 2 . Cope Coll.
Niobrara (Cretac.): Kansas.

Figured 1607 Snout portion of skull. By Cope as "Unknown Saurodont." *Loc. cit.* pl. xlvii, fig. 5. Formation and locality as preceding. Cope Coll.

Figured 1911 Three anterior vertebræ. By Cope as *Portheus ?* *Loc. cit.* pl. xlvi, fig. 13. Formation and locality as preceding . Cope Coll.

Semionotus agassizi (W. C. Redfield) 1841.

Figured 551 Complete fish on shale, well-preserved. Somewhat doubtful whether this is the specimen figured. *Ischypterus agassizii* (W. C. Redf.), Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 30, pl. iii . . . . Newb. Coll.
Newark series (Triassic): Boonton, N. J.

Figured 4675/1 Fine large fish on shale. Identified by Newberry. *Semionotus agassizii* (W. C. Redf.), Eastman, Ann. Rept. State Geologist N. J. 1904, p. 80, pl. vii. . . . . Stuart Coll.
Newark Series (Triassic): Sunderland, Mass.

Figured 4674/1 Fish on shale. *Semionotus agassizii* (W. C. Redf.), Eastman, *loc. cit.* p. 80, pl. viii. . . . . Stuart Coll.
(Newark) Series Triassic: Sunderland, Mass.

Semionotus brauni (Newberry) 1888.

Type 3191 Fish lacking the ventrals and greater part of caudal; on piece of metamorphosed shale. *Palæoniscus latus* (J. H. Redf.), L. P. Gratacap, Amer. Naturalist XX, 1886, p. 243, figure. *Ischypterus braunii* Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 44, pl. xiii, fig. 2.
Triassic: Weehawken, N. J.

Figured 671 Small fish lacking lower portion of head; on metamorphosed shale. Newberry *loc. cit.* p. 43, pl. xiii, fig. 1 . Newb. Coll.
Triassic: Weehawken, N. J.

Figured 1567 "Young" fish on shale. *Loc. cit.* pl. xii, fig. 3. Weehawken, N. J. . . . . Newb. Coll.

Semionotus elegans (Newberry) 1888.

Newark Series (Triassic): Boonton, N. J.

Cotype 534 Fish lacking greater part of caudal; on shale. "Largest individual [of this species] seen." — Newb. *Ischypterus elegans* Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 37, pl. xiv, fig. 2 . . . . Newb. Coll.

Cotype 539 Fish lacking caudal fin; on shale. *Loc. cit.* pl. vii, fig. 2.
Newb. Coll.

Cotype 1516 "Individual of medium size, showing broad dorsal fin."— Newb. *Loc. cit.* pl. xiv, fig. 1. *Semionotus elegans* (Newb.), Eastman, Annual Rept. N. J. State Geologist 1904, p. 91, pl. xii.
Newb. Coll.

Figured 550 Complete fish on shale. "Old individual."— Newb. Cotype of *Ischypterus modestus* Newberry. *Loc. cit.* p. 38, pl. ix, fig. 3 . . . . Newb. Coll.

Figured 593 "Mature individual."— *Ischypterus modestus* Newb. *loc. cit.* pl. ix, fig. 2 . . . . Newb. Coll.

Semionotus fultus (Agassiz) 1833–36.

Newark series (Triassic): Boonton, N. J.

Figured 602 Complete fish on shale. *Ischypterus fultus* (Agassiz), Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 34, pl. vi, fig. 2. *Semionotus fultus* Ag., Eastman, Ann. Rept. State Geologist N. J. 1904, p. 83, pl. ix . . . . Newb. Coll.

Figured 621 Complete fish, on shale. *Ischypterus macropterus* W. C. Redf. Newberry — *loc. cit.* p. 41, pl. xii, fig. 1 . . . Newb. Coll.

Figured 1519 Complete fish on shale. *Loc. cit.* pl. vii, fig. 1 . . Newb. Coll.

Semionotus gigas (Newberry) 1888.

Type 1595 Caudal extremity of a large fish; displays caudal and anal fins. *Ischypterus gigas* Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 49, pl. xiv, fig. 3 . . . . Newb. Coll.

Newark series (Triassic): Boonton, N. J.

Semionotus lineatus (Newberry) 1888.

Cotype 548 Complete fish, on shale. *Ischypterus lineatus* Newberry, *loc. cit.* p. 40, pl. xi, fig. 1 . . . . Newb. Coll.

Newark series (Triassic): Boonton, N. J.

Cotype 596 Fish on shale. *Loc. cit.* pl. xi, fig. 2. Formation and locality as preceding. . . . . Newb. Coll.

Semionotus micropterus (Newberry) 1888.

Cotype 591 "Fish of average size."— *Ischypterus micropterus* Newberry, *loc. cit.* p. 31, pl. iv, fig. 1 . . . . Newb. Coll.

Triassic: Durham, Conn.

Semionotus ovatus (W. C. Redfield) 1842.

Figured 580 Fish 28 cm. somewhat injured in region of ventral fins. *Ischypterus ovatus* (W. C. Redf.) Newberry, *loc. cit.* p. 27, pl. i.

Newark series (Triassic): Boonton, N. J. Newb. Coll.

Semionotus robustus (Newberry) 1888.

Type 572 Well-preserved fish on shale. *Ischypterus robustus* Newberry, *loc. cit.* p. 36, pl. vi, fig. 1 . . . . Newb. Coll.

Newark series (Triassic): Boonton, N. J.

Semionotus tenuiceps (Agassiz) 1843.

Triassic: New Jersey and Massachusetts.

Figured 535 "Old individual showing extreme development of dorsal scales" (Newb.), lacking caudal fin. *Ischypterus tenuiceps* (Agassiz), Newberry, Mon. U. S. Geol. Surv. XIV, 1888, p. 32, pl. v, fig. 1. Sunderland, Mass. . . . . Newb. Coll.

Figured 588 "Old individual" (Newb.), lacking caudal. *Ischypterus tenuiceps* (Ag.), Newberry, *loc. cit.* pl. v, fig. 2 (labeled fig. 3 *errore*). Sunderland, Mass. . . . . Newb. Coll.

Figured 672 Small fish lacking caudal. *Ischypterus latus* (J. H. Redf.), Newberry, *loc. cit.* p. 46, pl. xiii, fig. 3. Plainfield, N. J. Newb. Coll.

Figured 598 "Mature but not old individual."—*Ischypterus tenuiceps* (Ag.), Newberry, *loc. cit.* pl. vii, fig. 3. Sunderland, Mass. Newb. Coll.

Semionotus sp.

Figured 677a Small fish in counterpart; probably young. Type of *Ischypterus minutus* Newberry, *loc. cit.* p. 48, pl. xiii, figs. 5, 5a.
Triassic: Durham, Conn. Newb. Coll.

Spaniodon simus Cope 1878.

Cotype 2508 One nearly complete fish and a second one very poorly preserved lacking the head. Both this and the following specimen are labeled *type* in Cope's hand and are therefore to be regarded as cotypes. *Spaniodon simus* Cope, Bull. U. S. Geol. Surv. Terr. IV, 1878, p. 69; Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 47, pl. iv, fig. 1 (where this specimen, 2508, is regarded as the type and No. 2509 as the paratype) . . . Cope Coll.
Niobrara (Cretac.): Yankton, S. Dak.

Cotype 2509 Anterior half of a fish showing head and jaws. Cope, *loc. cit.* p. 69; Hay, *loc. cit.* pl. iv, fig. 2. Formation and locality as preceding . . . . Cope Coll.

Spermatodus pustulosus Cope 1894.

Type 7245 Portion of cranium. *Spermatodus pustulosus* Cope, Journ. Acad. Nat. Sci. Phila. [2], IX, 1894, p. 438, fig. 4 . . Cope Coll.
Permian: Texas.

SPHYRÆNODUS SILOVIANUS Cope. See *Dictyodūs silovianus* (Cope).
SQUALIUS REDDINGI Cope. " *Leuciscus reddingi* "

Stenoprotome hamata Hay 1903.

Type 3863 Head and anterior portion of trunk in counterpart. *Stenoprotome hamata* HAY, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 407, pl. xxvi, fig. 2; pl. xxvii, fig. 2 . Mt. Lebanon Coll.
Upper Cretaceous: Hakel, Mt. Lebanon, Syria.

Stratodus apicalis Cope 1872.

Type 1753 Palatines and fragments. The premaxilla and maxilla described by Cope not found by writer. *Stratodus apicalis* COPE, Proc. Amer. Philos. Soc. XII, 1872, p. 349; Cret. Vert. 1875, p. 227, pl. xlix, figs. 6, 7 . . . . Cope Coll.
Niobrara (Cretac.): Fort Wallace, Kans.

Stratodus oxypogon Cope 1877.

Type 2113 Distal part of right dentary, portion of right maxilla, fragment of palatine, eight vertebræ. *Stratodus oxypogon* COPE, Proc. Amer. Philos. Soc. XVII, 1877, p. 180; HAY, Bull. Amer. Mus. XIX, 1903, p. 80, figs. 66–68 . . . . . . Cope Coll.
Niobrara (Cretac.): Kansas.

Tegeolepis clarki (Newberry) 1888.

Type 230 Anterior half of fish, showing head, jaws and pectorals. Type of *Actinophorus clarkii* NEWBERRY. Trans. N. Y. Acad. Sci. VII, 1888, p. 179; Paleoz. Fishes N. Amer. 1889, p. 175, pl. xlix, fig. 1. *Tegeolepis clarkii* (Newb.), S. A. MILLER, First appendix 1892 [to N. Amer. Geol. and Pal.], p. 717.
Newb. Coll.
Cleveland shale (Up. Devon): Near Cleveland, Ohio.

TETHEODUS PEPHREDO Cope. See *Enchodus petrosus* Cope, No. 1605.

Trichiurus lepturus Leidy 1860.

Type $\frac{5683}{1}$ Two teeth. *T. lepturus fossilis* LEIDY, in F. S. Holmes, Post-Pleioc. Fos. S. Car. 1860, p. 121, pl. xxv, fig. 2 (two teeth only, not the cranium).
Post-pliocene: Simmon's Bluff, S. C.

Triænaspis virgulatus Cope. See *Leptotrachelus virgulatus* (Cope).

Urenchelys germanus Hay 1903.

Upper Cretaceous: Hajula, Mt. Lebanon, Syria.

Type 3654 Nearly complete fish lacking only extremity of caudal. Displays most of the cranial elements, the pectoral fins, origin of anal. *U. germanus* Hay, Bull. Amer. Mus. Nat. Hist. XIX, 1903, p. 434, pl. xxxvi, fig 1 . . . . Mt. Lebanon Coll.

Paratype 3790 Anterior half of fish. *Loc. cit.* pl. xxxvii, fig. 7. Mt. Lebanon Coll.

Paratype 3860 Head and anterior portion of trunk. *Loc. cit.* p. 436. Mt. Lebanon Coll.

Paratype 3862 Trunk of fish. *Loc. cit.* p. 436. Mt. Lebanon Coll.

Paratype 3695 Fish lacking part of head and posterior part of caudal region. *Loc. cit.* p. 436. Mt. Lebanon Coll.

Xiphias robustus Leidy. See *Istiophorus robustus* (Leidy).

Zebrasoma deani Hussakof 1907.

Type 7483 Entire fish 290 mm., on block of limestone. *Z. deani* Hussakof, Bull. Amer. Mus. Nat. Hist. XXIII, 1907, p. 125, pl. vii.

Tertiary: Antigua I., West Indies.

ost–Plioc.		Pleistoc.		Tertiary		Totals
ype	Fig'd	Type	Fig'd	Type	Fig'd	
						7
						99
						20
						17
						4
	2			1		43
						16
						9
						34
						17
						38
1		13		3		258
1	2	13		4		562

SUMMARY OF TYPE AND FIGURED SPECIMENS OF FOSSIL FISHES.[1]

	DEVONIAN		SUB-CARB.		CARBON.		PERMIAN		TRIAS		JURA		CRETAC.		EOCENE		MIOCENE		PLIOCENE		POST-PLIOC.		PLEISTOC.		TERTIARY		
	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	Type	Fig'd	TOTALS
ANTIARCHA	3	4																									7
ARTHROGNATHI	39	60																									99
INCERTÆ SEDIS	7	13																									20
ELASMOBRANCHII Pleuropterygii	9	4	3	1																							17
Ichthyotomi					2		2																				4
Plagiostomi	1		11	7	1				1				11	2	2	2	2					2			1		43
HOLOCEPHALI													15		1												16
INCERTÆ SEDIS (Pyctodontidæ)	7	2																									9
ICHTHYODORULITES	12		12	3	2	2	1						1		1												34
DIPNEUSTI	8	3			1		3						2														17
TELEOSTOMI Crossopterygii	5	23	1		4		1		2	2																	38
Actinopteri	1			1	5		2		11	28			79	72	30	8	4				1		13		3		258
TOTALS	92	109	27	12	15	2	9		14	30			108	74	34	10	6				1	2	13		4		562

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[1] Casts not included.

PLATE I.

All figures one-half natural size.

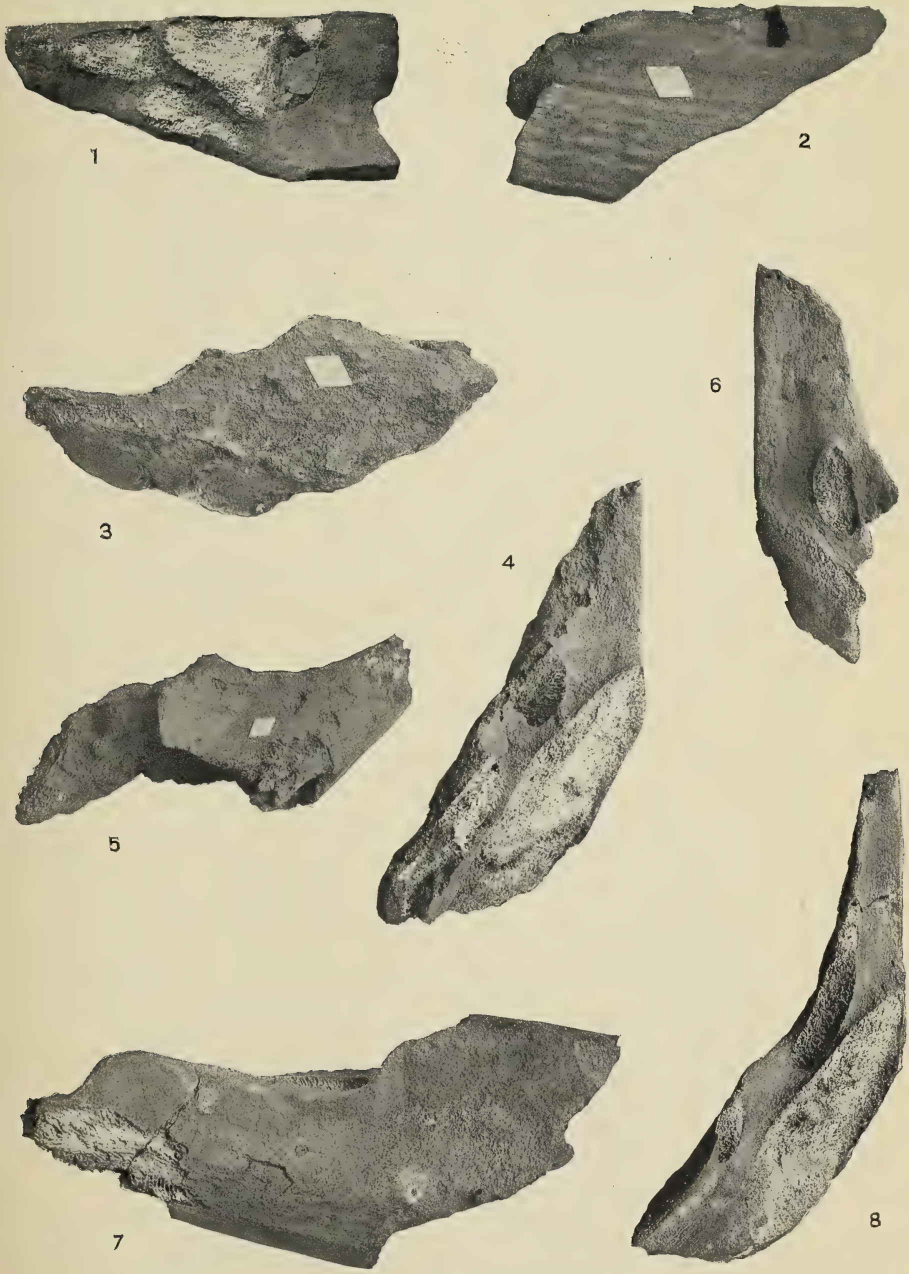
Figs. 1, 2.— *Edaphodon fecundus* (Cope). Right palatal element. One of the types; No. 2225. 1, oral and 2, outer aspects.

Figs. 3, 4.— *Edaphodon fecundus* (Cope). Left mandibular element. One of the seven type mandibulars; No. 2225. 3, outer and 4, oral aspects.

Figs. 5, 6.— *Edaphodon incrassatus* (Cope). Imperfect right mandibular. Type; No. 2234. 5, outer, and 6, oral aspects.

Figs. 7, 8.— *Edaphodon laterigerus* (Cope). Left mandibular. Type; No. 2238. 7, outer and 8, oral aspects.

Greensand (Cretaceous): New Jersey.



Chimæroid Dental Plates (Edaphodon).

PLATE II.

Figs. 1, 2.— *Edaphodon solidulus* (Cope). Left mandibular element, × about $\frac{2}{3}$. Type; No. 7193. 1, outer and 2, oral aspects.

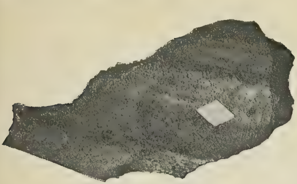
Fig. 3.— *Edaphodon mirificus* (Cope). Left mandibular element, oral aspect; × about $\frac{2}{3}$. Type of *E. gaskillii* (Cope). No. 7196.

Figs. 4, 5.— *Edaphodon smocki* (Cope). Right mandibular element, × $\frac{2}{3}$. One of three type mandibulars. No. 7192. 4, outer and 5, oral aspects.

Figs. 6, 7.— *Edaphodon stenobryus* (Cope). Right mandibular element, × $\frac{5}{7}$. Type; No. 7204. 6, outer and 7, inner aspects.

Figs. 8, 9.— *Leptomylus cooki* Cope. Right mandibular element, × $\frac{2}{3}$. Type; No. 7195. 8, outer and 9, oral aspects.

Greensand (Cretaceous): New Jersey.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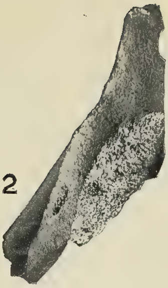
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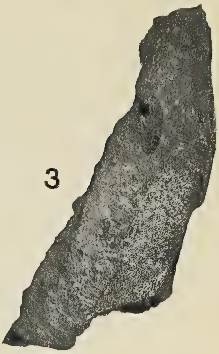
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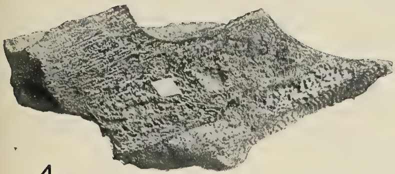
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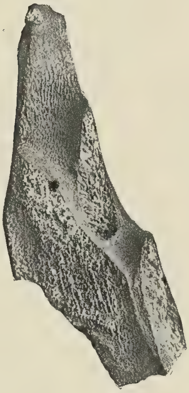
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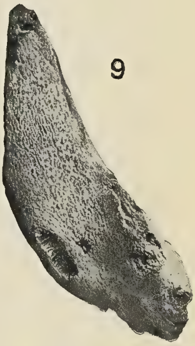
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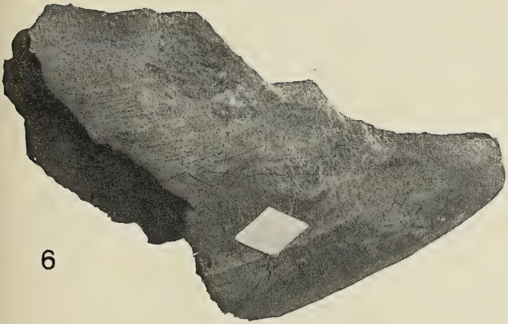
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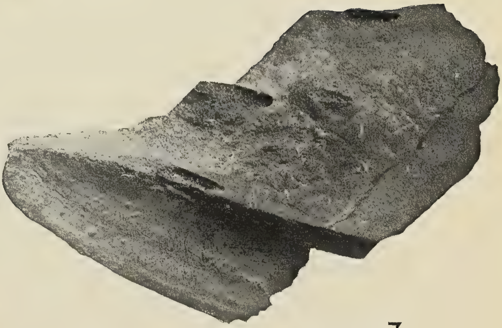
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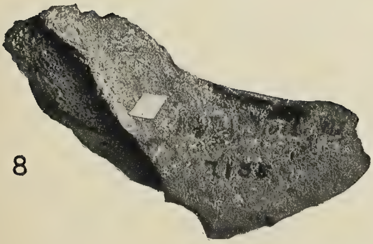
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CHIMÆROID DENTAL PLATES.

(Edaphodon and Leptomylus.)

PLATE III.

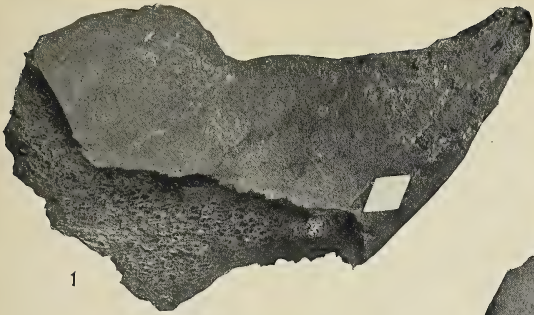
All figures one-half natural size.

Figs. 1, 2.— *Leptomylus forfex* Cope. Right mandibular element. Type; No. 2233. 1, outer and 2, inner aspects.

Figs. 3, 4.— *Isotœnia neocœsariensis* Cope. Palatal element. Type; No. 7208. 3, upper and 4, oral aspects.

Figs. 5, 6.— *Edaphodon tripartitus* (Cope). Both mandibular elements apparently of one individual. Type; No. 2224. 5, oral and 6, outer aspects.

Greensand (Cretaceous): New Jersey.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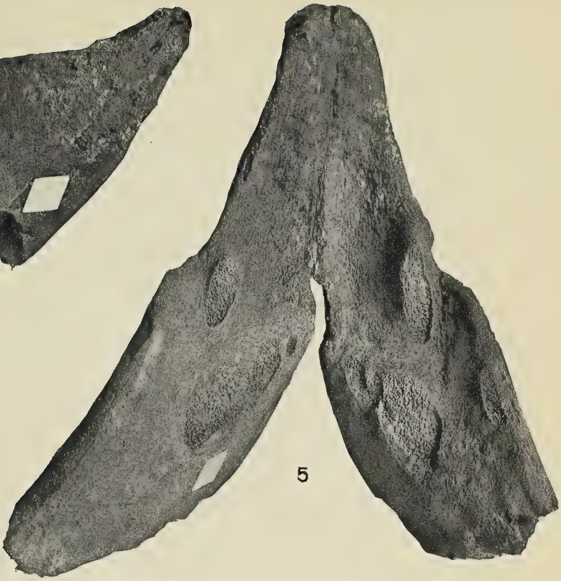
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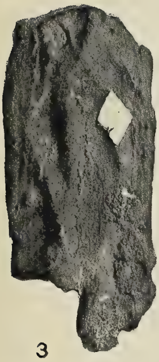
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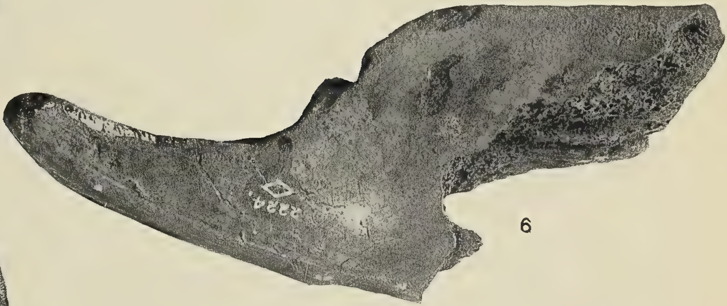

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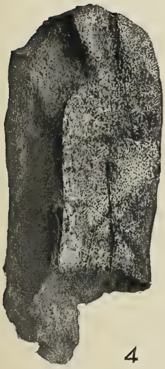
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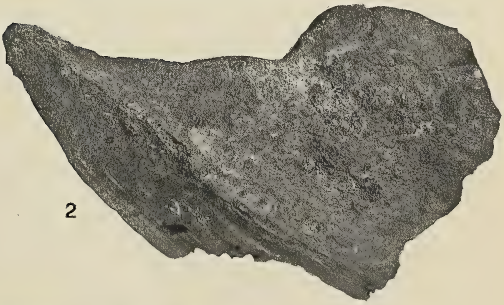
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CHIMÆROID DENTAL PLATES.
(Edaphodon, Isotænia and Leptomylus.)

PLATE IV.

Fig. 1.— *Cœlacanthus elegans* Newberry. × $1\frac{4}{9}$. Cotype: an almost perfect fish on coal. Scale ornamentation mostly lost in the figure but the lateral line is well shown. No. 656.

Coal Measures: Linton (now Yellow Creek), Jefferson Co., Ohio.

Fig. 2.— *Cœlacanthus ornatus* Newberry. × $1\frac{1}{6}$. Type: poorly-preserved fish represented mainly by impression in coal. No. 1135.

Coal Measures: Linton (now Yellow Creek), Jefferson Co., Ohio.

[illegible] IV.

Fig. 1.—Cœlacanthus [illegible] rry. × 1⅔. Cotype: an almost perfect fish on coal, [illegible] e but the lateral line is well shown. [illegible]

Coal Measures: [illegible] Co., Ohio.

Fig. 2.—Cœlacanthus [illegible] × 1⅔: poorly-preserved fish [illegible]

Coal Measures: [illegible] Jefferson Co., Ohio.

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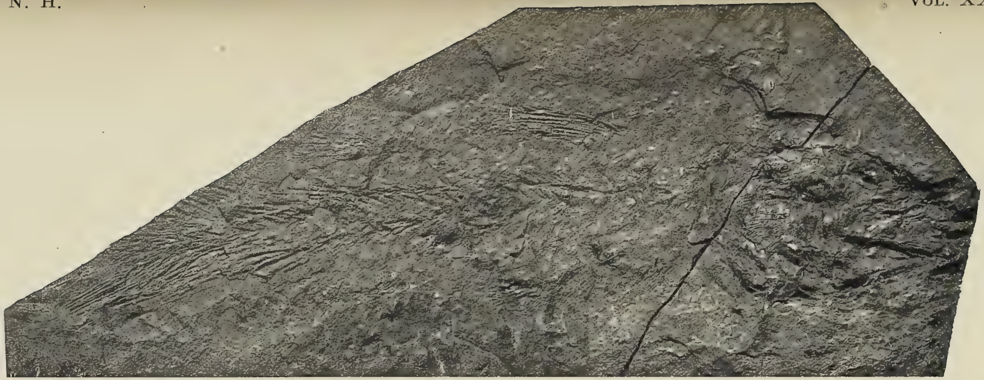

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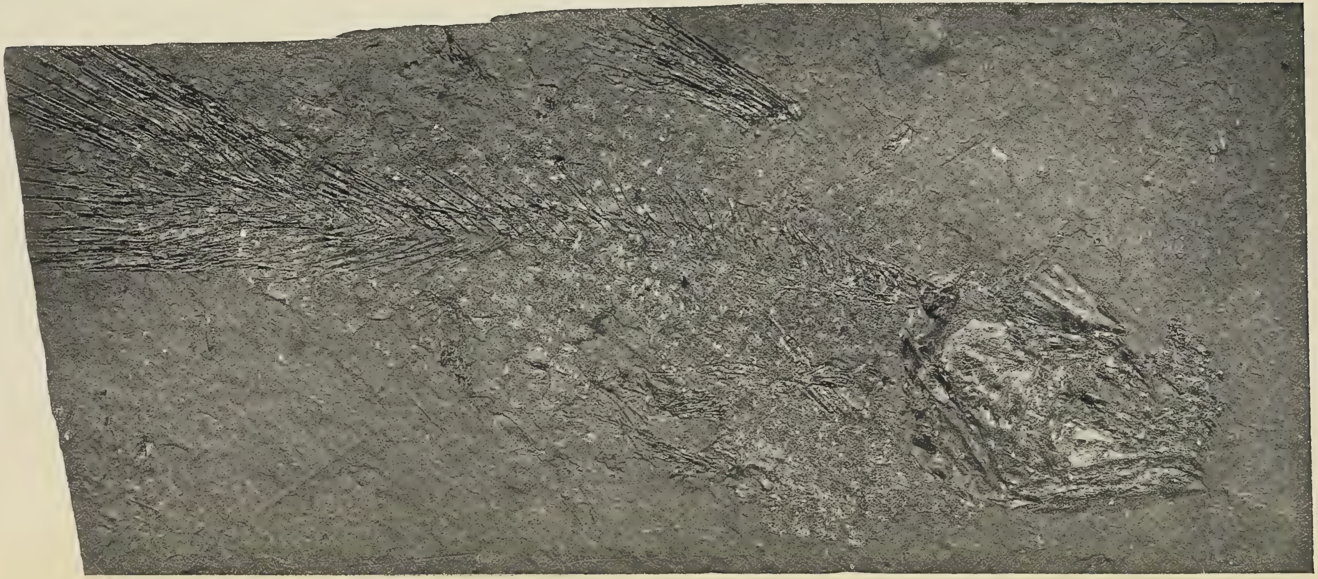


Cœlacanthus elegans and C. ornatus.

PLATE V.

All figures natural size.

Figs. 1, 2.— *Leuciscus reddingi* (Cope). Two of the three type pharyngeals. No. 2767. Pleistocene: S. Idaho.

Figs. 3, 4.— *Notropis angustarcus* (Cope). Two pharyngeals. Type; No. 2636. Pleistocene: Silver Lake, Oregon.

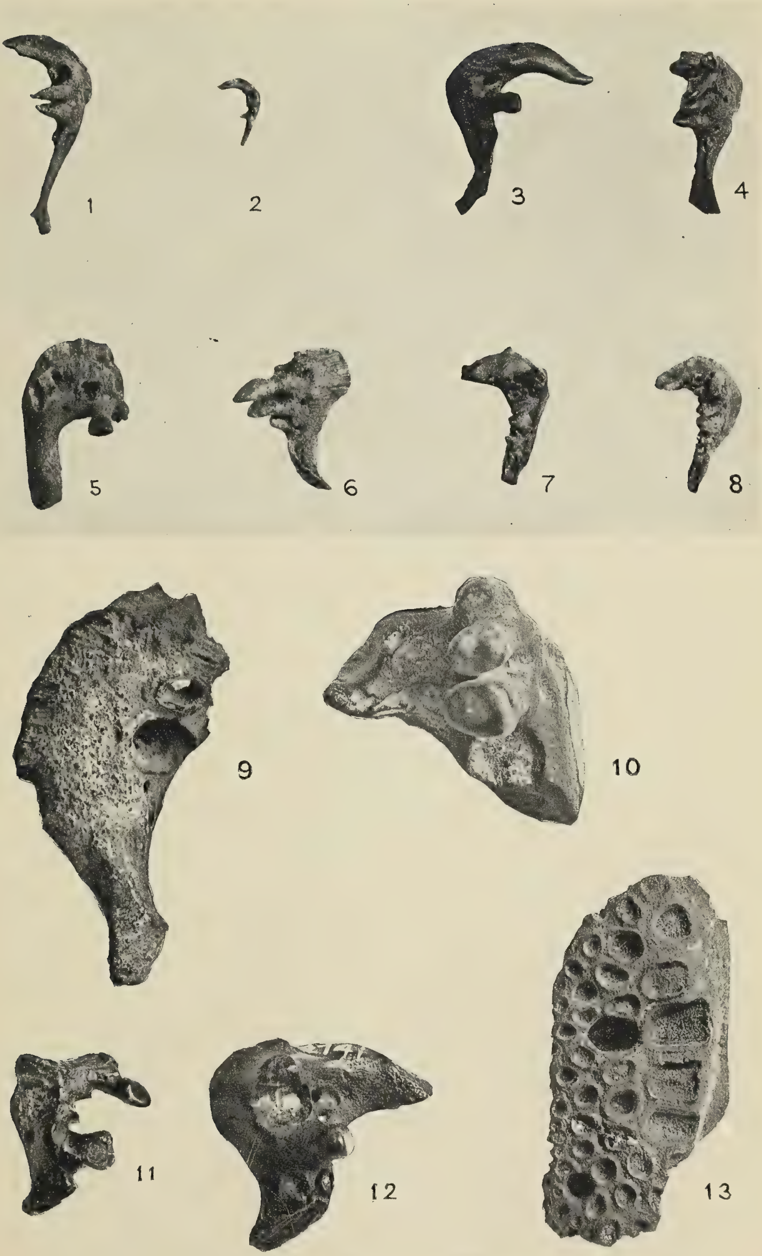
Figs. 5, 6.— *Diastichus strangulatus* Cope. Two pharyngeals. 5, is the type; No. 2764. 6, is probably a cotype; No. 2769. Late Tertiary: S. Idaho.

Figs 7, 8.— *Rutilus condonianus* (Cope). Two pharyngeals. Cotypes; Nos. 2756 and 2762. Equus beds (Pleistocene): Silver Lake, Oregon.

Figs. 9, 10.— *Mylocyprinus robustus* Leidy. Two of the type pharyngeals. No. 7529. Pleistocene: Castle Creek, Idaho.

Figs. 11, 12.— *Mylocyprinus inflexus* Cope. Two imperfect pharyngeals. Type; No. 2741. Pleistocene: Near Sinker Creek, Idaho.

Fig. 13.— *Pogonias multidentatus* Cope. Left superior pharyngeal. Type; No. 2247. Miocene: Nomini, Westmoreland Co., Va.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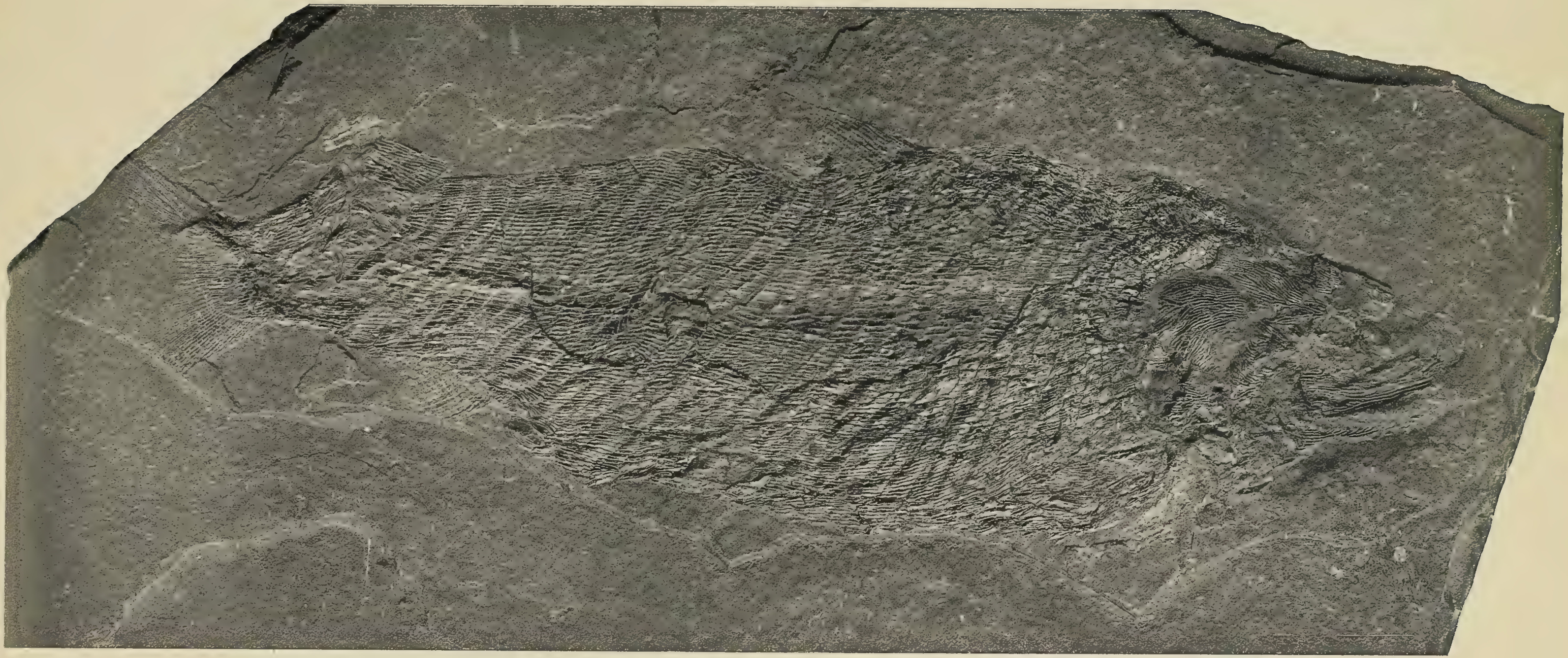
PHARYNGEAL BONES OF TELEOSTS.

PLATE VI.

Ptycholepis marshi Newberry.

An almost perfect fish; type specimen. Scales and the ornamentation of the cranial elements well shown. Slightly smaller than natural size. No. 575.

Newark series (Triassic): Durham, Conn.



PTYCHOLEPIS MARSHI *Newberry*.

BULLETIN

OF THE

AMERICAN MUSEUM OF NATURAL HISTORY.

VOL. XXV, PART II.

CATALOGUE OF TYPES AND FIGURED SPECIMENS OF FOSSIL VERTEBRATES IN THE AMERICAN MUSEUM OF NATURAL HISTORY.

II.—PERMIAN, TRIASSIC AND JURASSIC REPTILES OF SOUTH AFRICA.

BY R. BROOM.

Smithsonian Institution
MAR 5 1915
National Museum

JANUARY 4, 1915.

(Continued from 3d page of cover.)

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BULLETIN

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II.— PERMIAN, TRIASSIC AND JURASSIC REPTILES OF SOUTH AFRICA.

By R. Broom.

Preface.

Nearly all the specimens listed in this section of the Catalogue are included in the private collection of Doctor Robert Broom, acquired by the Museum in 1913. Dr. Broom devoted over six months in 1913–14 to the cataloguing and study of this collection and supervision of its preparation and installment, and the records have the unusual advantage of being revised by an authority of preeminent standing in this field and thoroughly familiar with the locality and history of practically every specimen listed. Manuscript and illustrations have also been checked over and revised by Mr. Walter Granger, and a few omissions corrected. Departing somewhat from the limitations of the first section of the Catalogue it has been thought better here to include all of the more important specimens and not to limit it strictly to the types and figured fossils. For obvious reasons also it is more descriptive, a number of genera and species making here their first appearance.

W. D. Matthew,
Curator.

Introduction.

The reptiles found fossil in the Karroo rocks of South Africa are among the most important forms met with in the whole range of geological history. The Karroo formation of South Africa is the only known deposit which yields an almost uninterrupted record of land animals for the two or three million years represented by the Permian and Triassic periods. And this portion of the world's history is about the most interesting one we could desire, for during this time we had the birth of not only all modern types of reptiles but also of the dinosaurs, the mammals and possibly the birds.

Almost all the specimens of South African fossil reptiles that have been discovered are found in five collections. The British Museum collection which contains almost all of Owen's types and most of Seeley's is by far the best known. The majority of the specimens were fully figured and described by Owen. Later they were catalogued by Lydekker, and Seeley has reexamined most of them, besides describing a large number of other specimens in a series of papers in the Philosophical Transactions of the Royal Society. The British Museum collection contains about one third of the known types, a good skeleton of *Pareiasaurus,* two good skeletons of *Dicynodon,* and the best collection of Cynodonts.

The South African Museum has a fairly large number of types, the best collection of Pareiasaurians, including four nearly complete skeletons, a mounted imperfect skeleton of *Endothiodon,* some good specimens of *Mesosaurus,* a good collection of Therocephalians, and by far the best collection of Dinosaurs.

The Albany Museum, Grahamstown, has a small number of types, a number of good skulls of Cynodonts, an almost perfect skeleton of *Lystrosaurus,* and an almost perfect skeleton of a small species of *Dicynodon.* In the Museum is also by far the best collection of specimens of *Procolophon.*

The private collection of Mr. Alfred Brown, of Aliwal North, contains besides the best collection of fossil plants a considerable number of very valuable types of Cynodonts and some beautiful skeletons of the Pseudosuchian *Euparkeria,* and a very fine collection of fossil fishes.

There are a few less important specimens in other museums, especially those of Bloemfontein, Pretoria, Port Elizabeth, and Kimberley. In Pretoria Museum are the very fine skeletons of the Stegocephalian *Rhinesuchus.*

The only other important collection is that of the American Museum, which in importance closely rivals that of the British Museum and of which the following is a catalogue of the more important specimens.

The Karroo system occupies the greater part of the interior of Cape Colony, the whole of Basutoland, most of the Free State, and much of the Transvaal and Natal. The whole thickness of the deposit, excluding the volcanic beds of the Drakensberg, is probably not less than 18,000 ft. though probably in no single locality are all the beds developed to the maximum thickness.

The lowest beds form the Dwyka series which is composed of the glacial tillite which is in places 1000 ft. thick and below and above which are 600 or 700 ft. of shales. Near the top of the upper shales is a band which contains the oldest known Karroo fossils (*Mesosaurus* and *Noteosaurus*), interesting from their close resemblance to species of the same genera in Brazil.

Above the Dwyka series we come to about 2600 ft. of shales and sandstones which form the Ecca series. This group of rocks is almost entirely unfossiliferous, only a very few forms having been obtained. *Archæosuchus* and *Eccasaurus* are the only known reptiles though it is possible that *Moschops* also comes from the upper Ecca beds.

Above the Ecca we come to the first moderately rich fossil-bearing strata, the *Pareiasaurus* zone of the Beaufort series. In this zone which is probably about 1000 ft. thick are, besides *Pareiasaurus* which is the typical form a number of Dinocephalians (*Tapinocephalus, Pelosuchus, Taurops*), large carnivorous reptiles of unknown affinities (*Titanosuchus, Scapanodon*), the small mammal-like reptiles which form the suborder Dromasaurians (*Galechirus, Galepus, Galeops*), a large number of Therocephalians (*Lycosuchus, Glanosuchus, Alopecodon, Pristerognathus, Pardosuchus, Hyænosuchus*), the first of the known Anomodonts (*Dicynodon*), some little lizard-like forms (*Heleosaurus, Heleophilus*), and what is probably the oldest known primitive Chelonian (*Eunotosaurus*).

Above the *Pareiasaurus* zone we come to about 1500 or 2000 ft. which form the *Endothiodon* zone. In these beds small species of *Dicynodon* are numerous and large Anomodonts called *Endothiodon* are common in the lower part of the zone. The carnivorous reptiles for the most part belong to the suborder Gorgonopsia (*Gorgonops, Scymnognathus, Ælurosaurus, Aloposaurus*), but there are also other carnivorous types, some of which may be true Therocephalians (*Scaloposaurus, Ictidognathus, Ictidosuchus*). The Pareiasaurians of this zone belong to the genus *Propappus.*

Above the *Endothiodon* zone we come to the *Cistecephalus* zone, which is probably 1500 to 2000 ft. thick. The lower beds are characterized by the presence of a peculiar small Anomodont *Cistecephalus.* The large Endothiodons no longer occur and their place is taken by large species of *Dicyondon.* The carnivorous types mostly belong to the Gorgonopsia (*Scymnognathus, Scylacops, Ictodorhinus, Cynosuchus, Tigrisuchus, Arctosuchus*). Small Diaptosaurian reptiles occur (*Youngina*).

All the above mentioned beds from the Dwyka to the *Cistecephalus* zone probably belong to the Permian period.

Above the *Cistecephalus* zone we come to deposit possibly 1500 ft. in thickness in which land animals are extremely rare, the only common fossils being the amphibious Anomodont *Lystrosaurus* and Palæoniscid fishes (Atherstonia).

The upper part of the *Lystrosaurus* zone runs into a narrower zone which is characterized by the presence of the remarkable little Corylosaurian *Procolophon. Lystrosaurus* still occurs in association with *Procolophon* but as the *Procolophon* beds are apparently a land formation and as land forms are not uncommon it seems well to keep the *Procolophon* zone distinct. Besides *Procolophon* we have the Cynodont *Nythosaurus* and the Pseudosuchian *Proterosuchus*. The *Procolophon* zone is probably comparatively thin, perhaps about 400 or 500 ft.

Above the *Procolophon* zone we have the *Cynognathus* zone which forms the upper part of the whole series and corresponds closely with the upper Triassic beds of Europe. The beds are characterized by the presence of a large number of different kinds of Cynodont reptiles, of which the best known are *Cynognathus, Lycognathus, Galesaurus, Gomphognathus, Diademodon, Trirachodon, Sesamodon, Melinodon,* and *Bauria.* Small Anomodonts are extremely rare but a large form of Dicynodont (*Kannemeyeria*) is not uncommon. A considerable number of small Diaptosaurians are known, some of which (*Euparkeria, Browniella*) are Pseudosuchians, and others (*Mesosuchus, Howesia*) are possibly more allied to the Gnathodonts. Stegocephalians are fairly common in some of the beds and mostly belong to the European genera (*Cyclotosaurus, Capitosaurus, Trematosaurus*), though other genera, not at present known outside of Africa, also occur (*Batrachosuchus, Micropholis, Bothriceps*). In the lower part of the zone there occurs the large primitive Phytosaur *Erythrosuchus,* though not fully adapted for amphibious habits like the typical Phytosaurs it agrees with them in all essential points of structure, except such as relate to the aquatic life.

Above those beds which represent the upper Triassic of Europe, we meet with a well developed zone of 2000 ft. of sandstones, shales, and mudstones, which are remarkable for the great abundance of plant remains and the almost entire absence of animal remains. These form the Molteno beds. By Seward the Molteno beds are regarded as being of Rhætic age.

Above the Molteno beds we have a series of reddish shales and sandstones which have been called Red beds. In these we have the remains of a large number of different species and genera of dinosaurs (*Euskelesaurus, Massospondylus, Thecodontosaurus, Gryponyx, Ætonyx, Geranosaurus, Plateosaurus*). Two Cynodonts are known from fragmentary remains and the primitive mammal, *Tritylodon.* A small Crocodilian genus, *Notochampsa,* also occurs. The Red beds in places are 1600 ft. thick.

Above the Red beds occurs a deposit of soft sandstone 600 or 800 ft. thick called the Cave Sandstone. In it fossils are very rare but a few dinosaur and crocodiles occur fairly similar to those of the Red beds.

There is little doubt that the Red beds and Cave Sandstone correspond in age with the lower Jurassic of Europe. This is rendered pretty certain by the fact of the Molteno beds being identified with the Rhætic and from the fact that *Notochampsa* is a true crocodile with the pubis not entering the acetabulum.

In the accompanying map is roughly indicated the position occupied by the various life zones. In the north part of Cape Colony and in the greater part of the Free State it has not been possible so far to trace the limits of the zone as fossils are extremely rare. The large majority of fossils are from the southern border of the basin.

CATALOGUE OF THE BROOM COLLECTION.

COTYLOSAURIA.

Pareiasaurus acutirostris Broom 1913.

5568 Imperfect skull of a small Pareiasaurian which may be referred with much probability to *P. acutirostris* Broom. It has been compared with the type which is in the Albany Museum, and agrees fairly satisfactorily.

Locality, ?. Horizon, *Pareiasaurus* zone. Collector, J. H. Whaits.

Pareiasaurus whaitsi Broom 1914. (Fig. 1.)

Type 5567 This species is founded on a fine skull found at Fraserburg Road by Mr. J. H. Whaits after whom the species is named.

In general proportions it agrees pretty closely with *P. serridens* and *P. baini,* but differs from both of these in the much larger size of the orbit and in the lower jaw having two horn-like processes instead of only one. In *Propappus omocratus* there are also two horn-like processes but they are quite differently arranged.

The teeth are badly preserved, those of the front of both upper and lower jaws being lost, and those further back broken. Six maxillary teeth near the posterior end of the series measure 70 mm.

The following are some of the principal measurements:

Length of skull from front to middle of "cheek"	455	mm.
" " " " " " " " occiput	405	"
" from snout to front of orbit	180	"
Distance between tabular bosses	220	"
Anteroposterior diameter of orbit	115	"
Back of orbit to middle of "cheek"	162	"

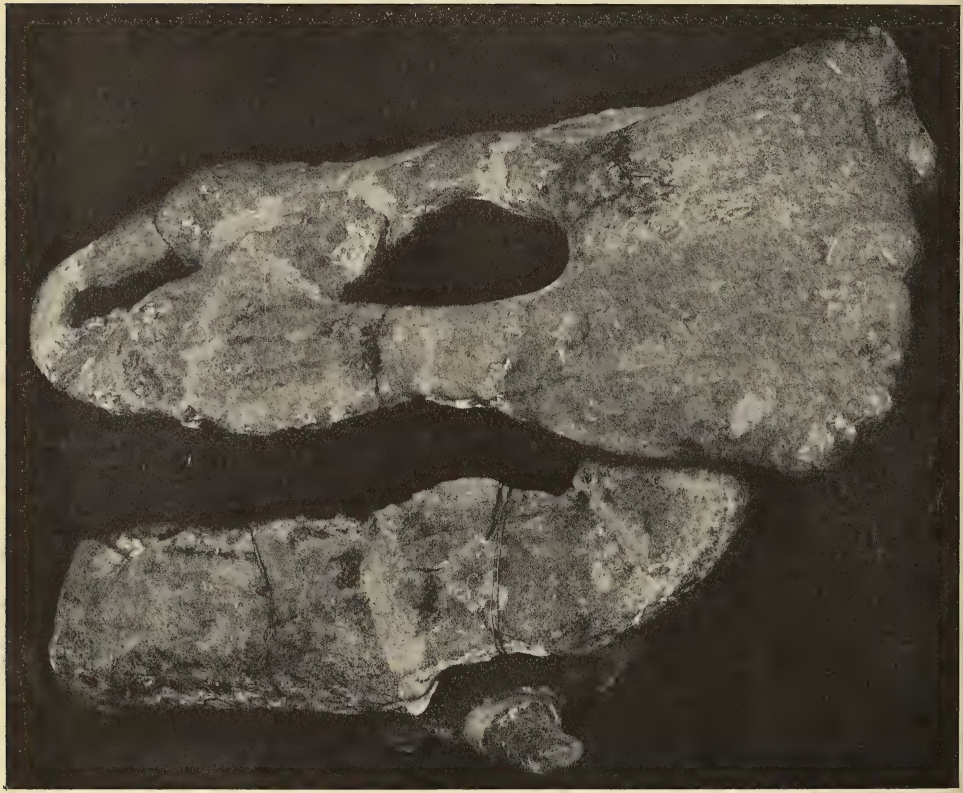

Fig. 1. *Pareiasaurus whaitsi* Broom. Type, No. 5567. × $\frac{1}{4}$. (From Amer. Mus. Journ.)

A preliminary description, with a figure, was given in Amer. Mus. Journ., XIV, p. 138, April, 1914.

Locality, Fraserburg Road. Horizon, *Pareiasaurus* zone. Collector, J. H. Whaits.

Propappus rogersi Broom 1912.

Type (Casts) 5604 — Cast of humerus, femur, radius, ulna and tibia of *Propappus rogersi* Broom. The originals are in the S. African Museum, Cape Town.

Described and figured in Ann. S. Afr. Mus., Vol. VII, Pt. V, 1912, p. 323, pll. xix–xxi.

Locality, Hoedemaker's Kraal, Beaufort West dist. Horizon, probably *Cistecephalus* zone. Collector, A. W. Rogers.

DINOCEPHALIA.

Moschognathus whaitsi Broom 1914.

Type 5602 — The greater part of both mandibles and much of the upper jaws with teeth of a Dinocephalian allied to *Moschops*. There are also present parts of the back of the skull, a large series of vertebræ and most of the ribs of the right side, much of both sides of the pelvis and both femora, besides other fragmentary remains.

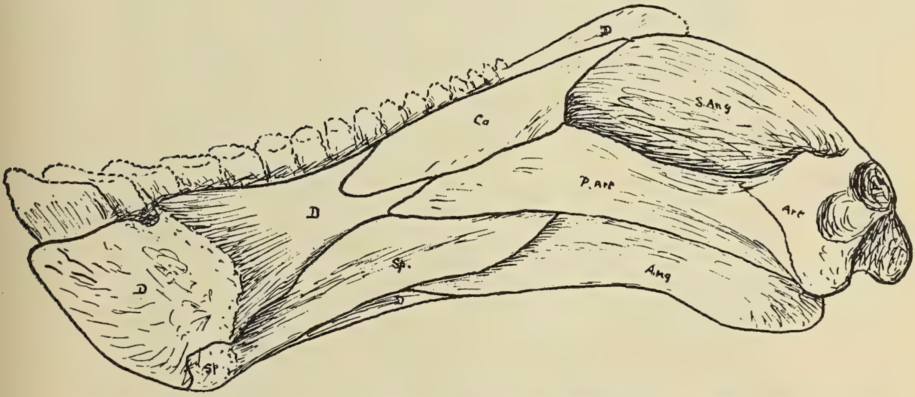

Fig. 2. *Moschognathus whaitsi* Broom. Type, No. 5602. × $\frac{2}{5}$. (From Bull. Amer. Mus. Nat. Hist.)

The jaw has been figured and briefly described in Bull. Amer. Mus. Nat. Hist., Vol. XXXIII, 1914, p. 137, fig. 2.

Locality, Beaufort West dist. Horizon, upper *Pareiasaurus* zone. Collector, J. H. Whaits.

Moschops capensis Broom 1911.

Type 5550	Nearly complete skull, with mandible which probably belongs to same individual. The skull has been figured and described in Proc. Zool. Soc., 1911, p. 1073, pl. xii, fig. 1. Locality, Spitzkop, Moordenaar's Karroo. Horizon, not improbably Upper Ecca series. No other determinable remains have been discovered in the neighbourhood, and it seems probable that were it in the *Pareiasaurus* zone some remains of *Pareiasaurus* would occur. Collector, R. Broom.
Topotypes 5551–5557	Within an area of about a rood there were found the remains of eight skeletons, all apparently belonging to the same species. The skulls differ mainly in the degree of thickening of the bones around the temporal fossa, while the limb bones and girdles differ only in size. I therefore conclude that the differences are due to age and sex, the larger thick-skulled forms being males, the more slender skulls females. The type skull is, I believe, that of a young female.

Tapinocephalus atherstonei Owen 1876. (Fig. 3.)

Figured 5611	Nearly complete shoulder girdles with fore limbs of *Tapinocephalus atherstonei* Owen. There are also preserved portions of each femur and a large number of very fragmentary remains of the skeleton. Figured in Am. Mus. Journ., Vol. XIV, p. 139, April, 1914. Locality, Beaufort West dist. Horizon, *Pareiasaurus* zone. Collector, J. H. Whaits.

Taurops macrodon Broom 1912.

Type 5610	Snout of a very large Dinocephalian. Described and figured in Proc. Zool. Soc., 1912, p. 859, pl. xc, fig. 1. Locality, Komsberg, Sutherland dist. Horizon, ? *Pareiasaurus* zone. Collector, J. H. Whaits.

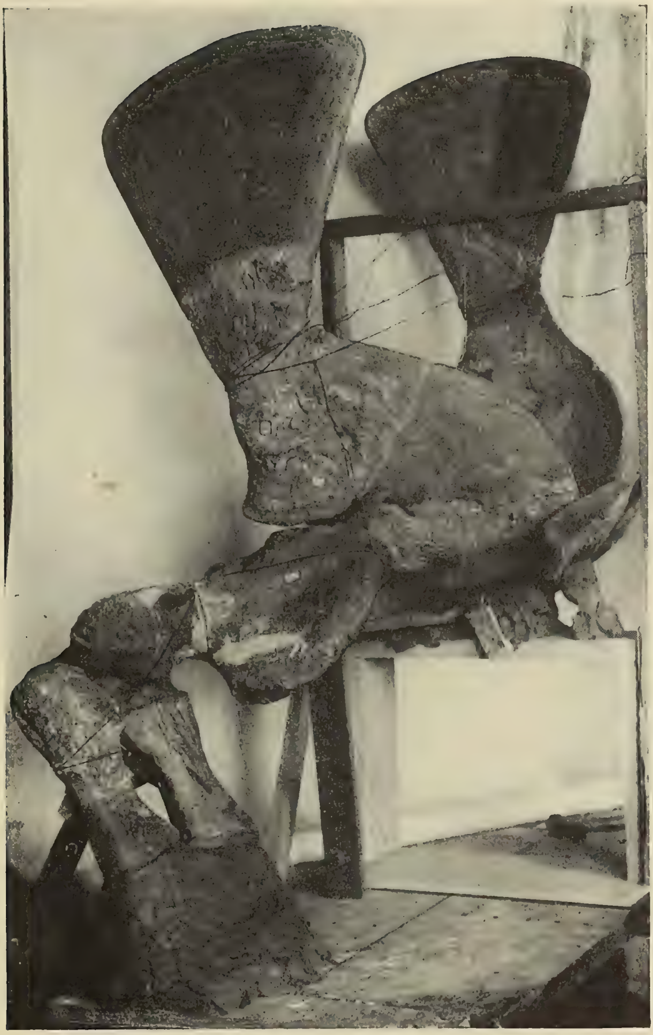

Fig. 3. Shoulder girdle and front limb of *Tapinocephalus atherstonei* Owen. No. 5611. × $\frac{1}{10}$. Partly restored. (From Amer. Mus. Journ.)

DROMASAURIA.

Galechirus scholtzi Broom 1907.

Topotype 5516 Impression of the left arm and leg with most of the tail, and other remains. The carpus and tarsus are beautifully shown, and the scapula and pelvis fairly well shown.

Locality, Victoria West, Cape Colony. Horizon, probably *Pareiasaurus* zone. Collector, T. J. R. Scholtz.

Galeops whaitsi Broom 1912.

Type 5536 Skull and anterior half of skeleton of a toothless Dromasaurian. The skull was described and figured in Proc. Zool. Soc., 1912, p. 860, pl. xci, fig. 6.

The following are some of the principal measurements: —

Length of skull about	60	mm.
" " mandible	47	"
" " humerus	50	"
" " ulna	37	"
" " radius	31	"

Locality, "La-de-da," Beaufort West dist. Horizon, *Pareiasaurus* zone, upper beds. Collector, J. H. Whaits.

5536 Counter slab, which shows much of the skull.

Galepus jouberti Broom 1910. (Figs. 4, 5.)

Type 5541 An almost perfect skeleton of a small Dromasaurian. The bones have completely disappeared and left in nearly

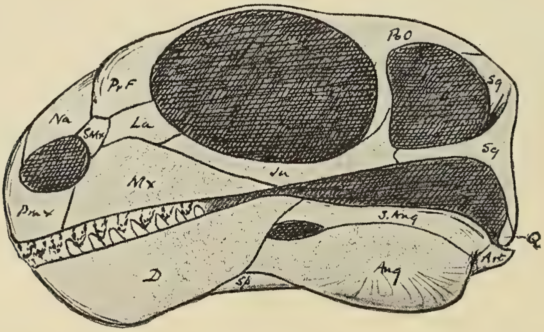

Fig. 4. *Galepus jouberti* Broom. Type, No. 5541. × $\frac{5}{3}$. Slightly restored. (From Bull. Amer. Mus. Nat. Hist.)

every case perfect impressions. The right manus is only partly preserved and most of the left arm is missing, but with these exceptions the skeleton is complete.

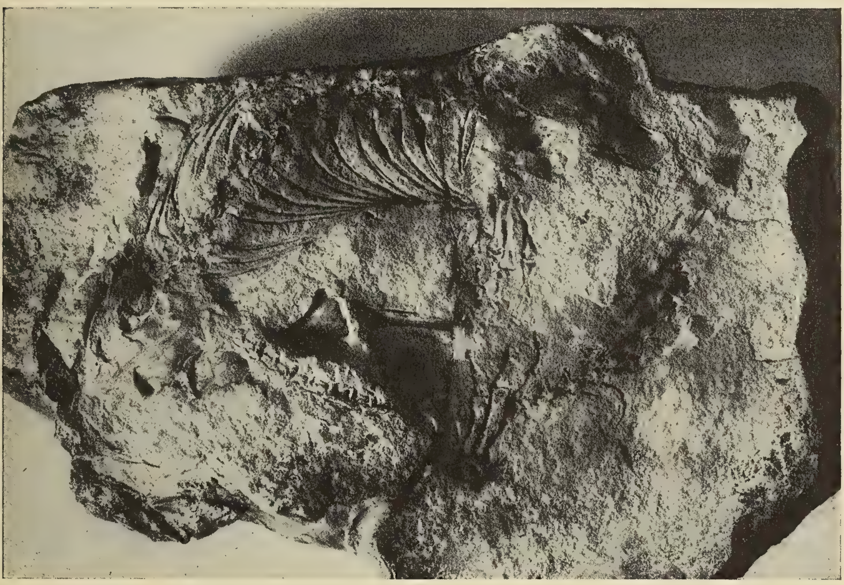

Fig. 5. *Galepus jouberti* Broom. Type, No. 5541. × ½. (From Amer. Mus. Journ.)

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXVIII, 1910, p. 204, fig. 3.

Locality, Near Richmond Road, Cape Colony. Horizon, probably *Pareiasaurus* zone. Collector, Joubert.

THEROCEPHALIA.

Alopecodon priscus Broom 1908.

5569 This specimen is the antorbital portion of a skull which is badly weathered. It shows, however, very satisfactorily the unusually large number of incisors. In front of the large canine are 9 teeth, 8 of which are incisors and one a small 1st canine.

Locality, Fraserburg Road. Horizon, *Pareiasaurus* zone. Collector, J. H. Whaits.

Alopecognathus angusticeps gen. et. sp. nov.

Type 5559

This new genus and species is founded on a beautiful complete skull of a large Therocephalian from the upper *Pareiasaurus* zone.

Though the skull is nearly perfect unfortunately owing to the nature of the bone it is almost impossible to make out any of the sutures.

The whole skull is narrow and deep. The orbits are placed near the middle and are relatively small. The frontal region is unusually small and the parietal region forms a narrow crest. From the orbit to the front of the snout is 143 mm. The greatest length of the skull is 276 mm. The greatest width is probably about 140 mm.

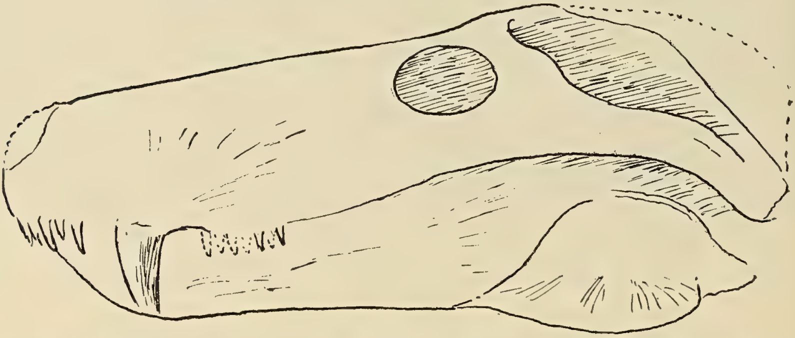

Fig. 6. Skull of *Alopecognathus angusticeps* Broom. Type, No. 5559. × $\frac{2}{5}$.

There are 6 incisors of which the posterior one at least is much flattened. Probably all, certainly most, are serrate behind. They occupy a space of 33 mm. Between the 6th incisor and the canine is an unusually short diastema of only 7 mm. The canine is relatively small and slender. It has an antero-posterior measurement of 12 mm. and a height of about 30 mm. What is probably the 1st molar is situated 15 mm. behind the canine and the whole series of 6 molars occupies a space of 30 mm.

The angular is a large oval bone as it shows on the outer side and though somewhat corrugated lacks the peculiar cross bar of the Gorgonopsians.

Locality, Grootfontein, 13 miles S. W. of Beaufort West. Horizon, upper part of *Pareiasaurus* zone. Collector, J. H. Whaits.

Alopecorhinus parvidens Broom 1912.

Type 5503	Imperfect front portion of skull. Described and figured in Proc. Zool. Soc., 1912, p. 864, pl. xci, fig. 9. Locality, Beaufort West Commonage. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Arnognathus parvidens Broom 1907.

Natural Cast of Type 5619	Natural cast of dentary of *Arnognathus parvidens* Broom. The dentary is in the S. African Mus. Collection. Described and figured in Trans. S. Afr. Phil. Soc., 1907, Vol. XVIII, Pt. 1, p. 38, pl. iii, fig. 6. Locality, Victoria West. Horizon, *Pareiasaurus* zone. Collector, J. T. R. Scholtz.

Eriphostoma microdon Broom 1911.

Type 5524	An imperfect skull, much weathered and lacking a part of the middle regions. *Eriphostoma* being the oldest known Therocephalian in which the occiput is shown, the condition calls for some note. There is certainly a large median supraoccipital situated between the foramen magnum and the interparietal. The interparietal, though apparently single, has some evidence from the direction of the bony fibres of having been formed from two centres of ossification. External to the supraoccipital is a bone which appears to be part of the squamosal. A small tabulare may be present by the side of the interparietal but if so it is very small if the lower bone be correctly identified as squamosal. Described and figured in Proc. Zool. Soc., 1911, p. 1078, pl. lxiii, fig. 12. Locality, Fraserburg Road. Horizon, *Pareiasaurus* zone. Collector, J. H. Whaits.

Ictidognathus hemburyi Broom 1912.

Type 5520	Middle and front portion of skull, with mandibles in good preservation. The incisor teeth are well shown, but the molars badly. Described and figured in Proc. Zool. Soc., 1912, p. 865, pl. xci, figs. 10, 11.

Locality, Beaufort West. Horizon, lower part of *Endothiodon* zone. Collector, H. J. Hembury.

Topotype 5521 Anterior half of skull, with mandibles showing most of the dentition, the canine very beautifully. The snout has been broken across and shows the paired prevomers distinct but in fairly close contact. Each is curved as if to lodge Jacobson's organ. The condition is interesting for its close resemblance to the condition in *Ictidognathus parvidens,* from which it only differs in that in the latter the prevomers are fused. This difference suggests that the two types may be generically distinct, but as they are certainly closely allied it will probably be more convenient till further material is obtained to keep them in the same genus.

Locality, Beaufort West. Horizon, lower part of *Endothiodon* zone. Collector, H. J. Hembury.

Ictidognathus parvidens Broom 1911.

Type 5522 Anterior half of skull, with mandibles attached.

Described and figured in Proc. Zool. Soc. 1911, p. 1078, pl. lxii, fig. 5 and pl. lxiii, fig. 11. Since then the snout has been broken across and shows the prevomers fused but scroll-like. They are being figured.

Locality, Mek, at Kuilspoort, Beaufort West dist. Horizon, lower beds of *Cistecephalus* zone. Collector, R. Broom.

Ictidosaurus angusticeps Broom 1908.

5527 A fairly well preserved specimen of the antorbital portion of the skull with the mandibles attached. It shows the teeth much better than does the type which is the only other known specimen of the species. There are evidently 9 small pointed molars, and the canine is remarkably long and slender. The length from the base to the tip of the canine is probably as much as 40 mm., though the antero-posterior length of the base of the tooth is only about 11.5 mm.

Locality, Beaufort West. Horizon, near base of the *Endothiodon* zone. Collector, J. H. Whaits.

Ictidosuchus primævus Broom 1900.

Type 5529 Portion of skeleton of small Therocephalian. The remains include much of the upper part of the skull, but the front of the snout and much of the left side are lacking. The left dentary is present in fairly good condition. The left scapula, coracoid and precoracoid are well preserved, and much of both humeri, with a tibia and some of the posterior bones of the jaw. When first described a description was given of what was believed to be the left femur. A re-examination of the specimen afterwards showed that this supposed femur is really the left humerus. *Ictidosuchus* is one of the most remarkably aberrant Therocephalians known, quite unlike any other known genus except perhaps *Arnognathus* which is only known by the dentary.

Described and a figure given of the mandibles in Ann. Mag. Nat. Hist., Vol. VI (7th ser.) No. xxxiii, 1900, p. 314. A fuller description of the remains with figures of all the important bones was published in Trans. S. Afr. Phil. Soc., Vol. XI, pt. 3, 1901, p. 177, pll. xxvi, xxvii, figs. 1–9.

Locality, 10 miles N. E. of Pearston, Cape Colony. Horizon, probably upper *Endothiodon* zone. Collector, R. Broom.

Pristerognathus platyrhinus Broom 1912.

Type 5502 Greater part of front half of skull with mandibles in position.

Described and figured in Proc. Zool. Soc., 1912, p. 863, pl. xci, fig. 8.

Locality, Grootfontein, Beaufort West dist. Horizon, probably upper part of *Pareiasaurus* zone. Collector, J. H. Whaits.

Scylacoides ferox gen. et sp. nov. (Fig. 7.)

Type 5558 This new genus and species is founded on the preorbital portion of a medium sized skull. It is so considerably crushed that any drawing of it will give a misleading idea.

It differs from *Ælurosaurus* in having 6 molars and in being much more heavily built.

There are 5 incisors which occupy a space of 23 mm. followed by a diastema of 11 mm.

The canine has an antero-posterior measurement of 11 mm. followed by a diastema of 6.5 mm.

There are 6 molars which occupy a space of 24 mm.

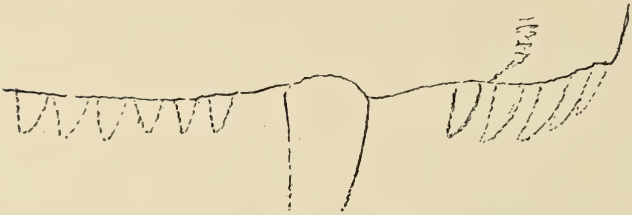

Fig. 7. Dentition of *Scylacoides ferox* Broom. Type, No. 5558. Natural size.

The length from the orbit to the tip of the snout is about 102 mm.

The specimen is too imperfect to enable one to say whether it is a true Therocephalian or a Gorgonopsid, more probably the former.

Scylacorhinus falkenbachi gen. et sp. nov. (Fig. 8.)

Type 5560 This new genus and species is founded on an imperfect skull of a small Therocephalian. The specimen includes the maxillaries, premaxillaries and dentaries, with small portions of a few other bones. The jaws and teeth are in fairly good condition.

The new genus has a dental formula of I^7, C^2, M^8, and its nearest affinities are with *Alopecodon* which has a formula of I^8, C^2, M^8 and *Scylacosaurus* which has a dental formula of I^6, C^2, M^7 or ^{8}, and is practically intermediate between these two genera. *Alopecodon* has six large incisors and two small ones; *Scylacosaurus* has five large incisors and one small one; *Scylacohinus* has five large incisors and two small ones.

The first five incisors are apparently all somewhat flattened and with serrated posterior borders. They occupy a space of 22 mm. The last two incisors are so small that they occupy practically the same space as does the fifth incisor alone. The whole incisor series measures 27 mm. Following the incisors is a diastema of 8 mm., behind which is the small 1st canine about equal in size to the 7th incisor. The second canine is long and slender. It has an antero-posterior measurement of about 9 mm., and is probably about 30 mm. in height. The 1st molar lies 8 mm. behind the canine and the eight molars occupy a space of 33 mm. The whole dental series occupies a space of 84 mm. in a straight line.

Below the nostrils are a couple of moderate sized oblong foramina, one on each side, such as I have not previously noticed in Therocephalians though not improbably they are of common occurrence.

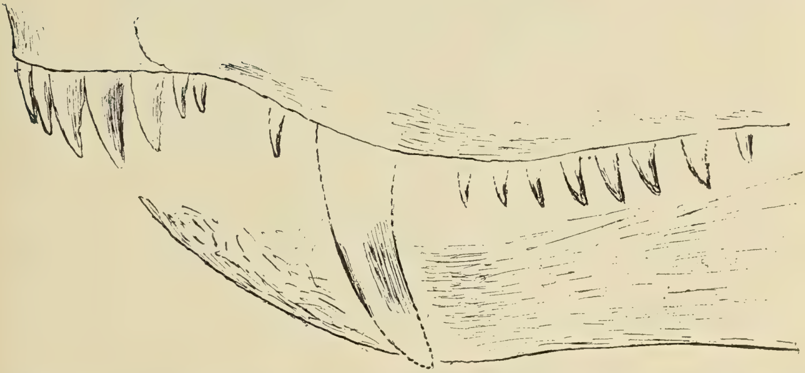

Fig. 8. Dentition of *Scylacorhinus falkenbachi* Broom. Type, No. 5560. Slightly enlarged.

I have much pleasure in naming this new specimen after Mr. Charles Falkenbach who has devoted so much time and care to the preparation of the South African collection.

Locality, Beaufort West dist. Horizon, probably Upper *Pareiasaurus* zone. Collector, J. H. Whaits.

Trochosuchus major sp. nov. (Fig. 9.)

Type 5543

This new species is founded on an imperfect skull obtained at Rietfontein, Prince Albert dist., Cape Colony. It consists of the great part of the skull, lacking the whole of the occiput and with the surface of the bone much weathered.

The nasals are broad in front and posteriorly narrow to a sharp point, the two passing between the frontals. The posterior end of the nasal is about 20 mm. in front of the plane of the front of the orbit. The premaxilla is largely overlapped by the maxilla. It bears 5 incisors. These are large roundish teeth with an outer and posterior ridge which is strongly serrated. The 5 incisors occupy a space of 38 mm. as against 24 mm. in *Trochosuchus acutus* Broom. The maxilla is moderately large and carries two large canines and three molars. The two canines together measure 29 mm. The thought has frequently occurred to me and possibly to others, may it not be possible that one of the large canines is a replacing tooth, and this seems not unlikely because very often only one of the two teeth are functional, the other being badly broken or worn. But this conclusion is hardly possible for we now know a number of specimens of *Lycosuchus, Hyænosuchus* and *Trochosuchus,* and all agree in having always at least the roots of both teeth. Further there is evidence that at least the posterior of the two teeth is replaced by a new tooth behind it and that the anterior tooth is not a tooth replacing the second canine. We may thus assume that these three genera have two large canines in each maxilla probably each of which is indefinitely replaced. There are three molars in the lower jaw and though they are not preserved in the upper there have probably also been three. The three molars measure about 17 mm.

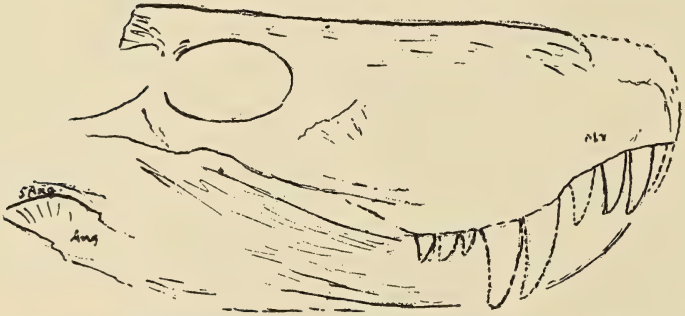

Fig. 9. **Skull of *Trochosuchus major* Broom. Type, No. 5543. × $\frac{2}{5}$. The canines are partly restored from the other side.**

The lacrymal and prefrontal are both large. The distance from the orbit to the front of the snout is about 113 mm.

Trochosuchus is allied to *Lycosuchus* and like it a typical Therocephalian with narrow intertemporal region and no preparietal. There is a distinct postfrontal bone.

Locality, Rietfontein, Prince Albert dist. Horizon, *Pareiasaurus* zone, probably lower beds. Collector, ?.

GORGONOPSIA.

Ælurosaurus felinus Owen 1881.

Probably Topotype	Anterior half of skull with mandible in position, in very good condition.
5514	Locality, Beaufort West, Cape Colony. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

?Ælurosaurus felinus Owen 1881.

5607	Both hind limbs and much of both sides of the pelvis with some vertebræ and a humerus of a small Gorgonopsian, probably *Ælurosaurus felinus* Owen.
	The pelvis and ischium are plate-like in type and the ilium is remarkable for the low development of the post-acetabular portion of the crest.
	Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Ælurosaurus striatidens Broom 1912.

Type	Imperfect snout, showing most of the teeth.
5506	Described and figured in Proc. Zool. Soc., 1912, p. 863, pl. xci, fig. 7.
	Locality, Kuilspoort, Beaufort West dist. Horizon, *Endothiodon* zone, about 500 ft. above Beaufort West township. Collector, R. Broom.

Ælurosaurus tenuirostris Broom 1911.

Type	Most of preorbital portion of skull.
5504	Described and figured in Proc. Zool. Soc., 1911, p. 1077, pl. lxiii, fig. 9.
	Locality, Nek at Kuilspoort, Beaufort West dist. Horizon, lowest beds of *Cistecephalus* zone. Collector, R. Broom.

Ælurosaurus whaitsi Broom 1911.

Type	Front of mandibles and fragments of snout.
5528	Described and figured in Proc. Zool. Soc., 1911, p. 1077, pl. lxiii, fig. 8.
	Locality, Beaufort West. Horizon, lower part of *Endothiodon* zone. Collector, J. H. Whaits.

Topotype 5513 Anterior half of skull, with jaws in position, somewhat weathered but showing the incisors very satisfactorily and the canines fairly.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Aloposaurus gracilis Broom 1910.

Type 5317 Nearly perfect skull with mandibles attached.

Briefly described and illustrated by a slightly restored side view in Bull. Amer. Mus. Nat. Hist., Vol. XXVIII, 1910, p. 208, fig. 7.

The following are a few further details: — The five incisors measure 14 mm. followed by a diastema of 10 mm. From the front of the replacing canine to the back of what is believed to be the 6th molar is 23 mm. The greatest length of the skull is 120 mm. The frontal width is about 26 mm. and the intertemporal measurement about 30 mm. The parietal region is typically Gorgonopsid, there being a distinct preparietal. As the parietal region and the occiput are crushed the exact structure cannot be very clearly made out. There is certainly a large well preserved interparietal and a large squamosal but whether the squamosal articulates with the interparietal or whether there is between them a distinct tabulare is not quite clear.

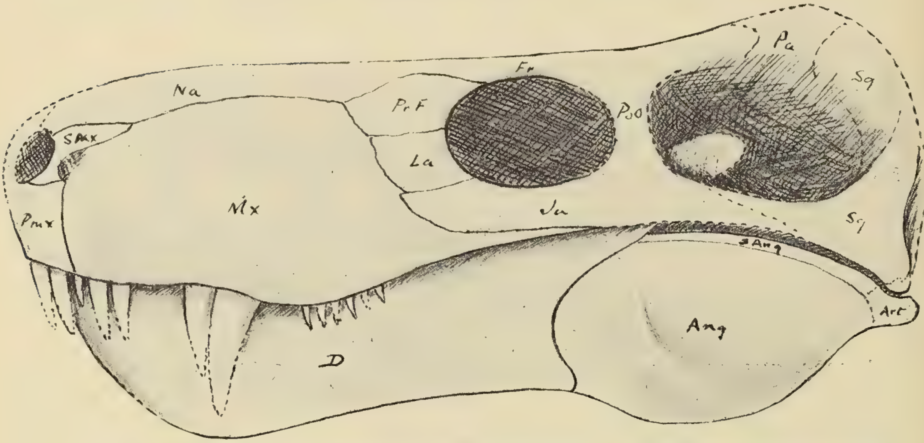

Fig. 10. *Aloposaurus gracilis* Broom. Type, No. 5317. Slightly under natural size. (From Bull. Amer. Mus. Nat. Hist.)

There is a very deep median plate formed by the basisphenoid.

Locality, Kuilspoort, Beaufort West dist. Horizon, *Endothiodon* zone, about 1500 ft. above Beaufort West horizon. Collector, R. Broom.

Asthenognathus paucidens gen. et sp. nov.

Type 5562 This new genus and species is founded on a remarkable Gorgonopsian mandible found by Mr. Whaits at Witte Hart in the Nieuweveld. Though only the mandible is known we can be quite certain that it is quite a new type, as no Gorgonopsian has hitherto been discovered with two molars.

The jaw has the canine nearly perfectly preserved and though the crowns of the other teeth are lost the bases of all are preserved and their relations and sizes can be clearly seen.

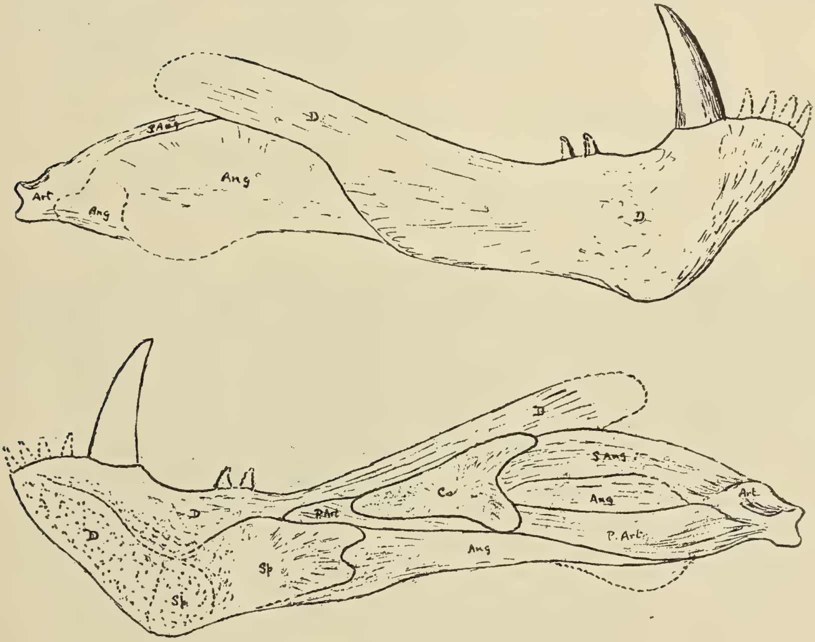

Fig. 11. Jaw of *Asthenognathus paucidens* Broom. Type, No. 5562. × ½.

The two mandibles are closely united by a large deep symphysis which slopes much more than in *Scymnognathus*. There are 4 lower incisors which are each nearly round in section at the base. They occupy a space of 22 mm. The canine has an antero-posterior measurement of 12 mm. and a height of about 38 mm. Behind the canine is a diastema of 20 mm., followed by 2 molars which occupy a space of 11 mm. The total length of the dental series is in a direct line 66 mm.

The structure of the jaw will be best understood by the drawing. It will be seen to agree essentially with the previously known jaw of *Scylacops*. The total length of the jaw is 217 mm.

Locality, Wittekop, Neiuweveld. Horizon, *Cistecephalus* zone. Collector, J. H. Whaits.

Gorgonops torvus Owen 1876.

Probably Topotype 5515	Almost perfect skull without the mandible. It shows very satisfactorily that there is a fair sized temporal opening. Locality, Beaufort West, Cape Colony. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Ictidorhinus martinsi Broom 1913.

Type 5526	Complete skull, without mandibles, considerably crushed. Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 560, fig. 4.

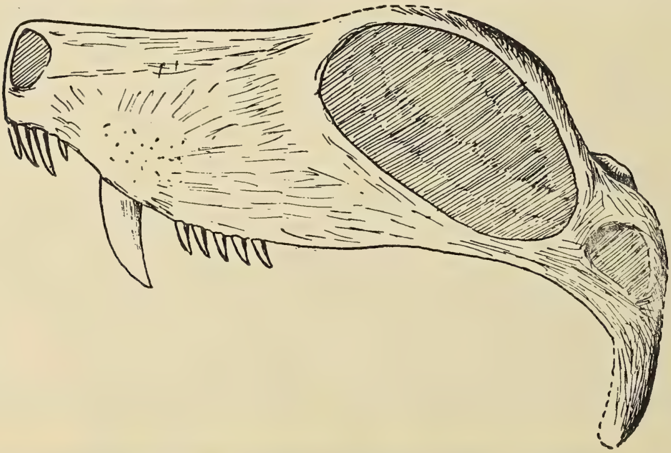

Fig. 12. *Ictidorhinus martinsi* Broom. Type, No. 5526. Natural size. (From Bull. Amer. Mus. Nat. Hist.)

Locality, Wilgebosch, near New Bethesda, Cape Colony. Horizon, *Cistecephalus* zone, about 1000 ft. above horizon of New Bethesda. Collector, J. H. Martins.

Scymnognathus angusticeps Broom 1913.

Type	Complete skull, with jaws in position, slightly crushed.
5537	Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 558, fig. 2.

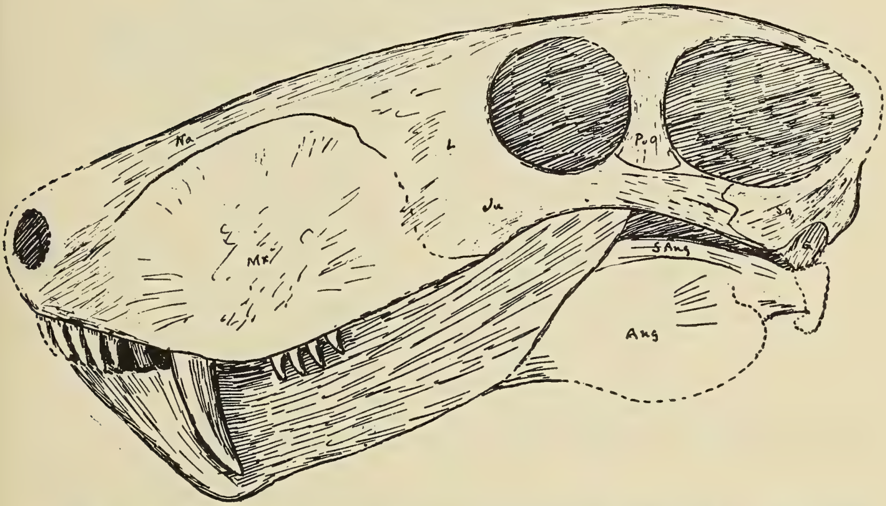

Fig. 13. *Scymnognathus angusticeps* Broom. Type, No. 5537. × $\frac{2}{3}$. (From Bull. Amer. Mus. Nat. Hist.)

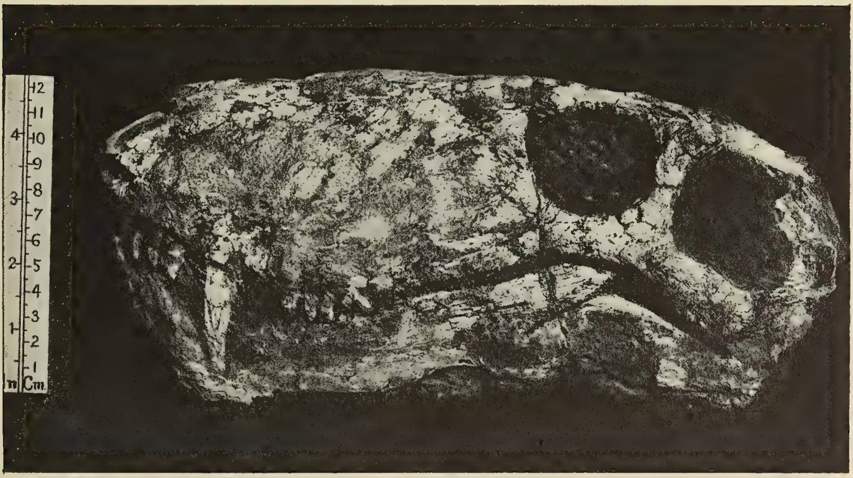

Fig. 14. *Scymnognathus angusticeps* Broom. Type, No. 5537. (From Amer. Mus. Journ.)

Locality, Wilgebosch, near New Bethesda, Cape Colony. Horizon, *Cistecephalus* zone, about 600 ft. above horizon of New Bethesda. Collector, R. Broom.

Scymnognathus minor Broom 1913.

Type 5535 Greater part of skull and much of the skeleton, in a much crushed and rather badly weathered condition.

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 559, fig. 3.

Locality, New Bethesda. Horizon, probably middle region of *Cistecephalus* zone. Collector, R. Broom.

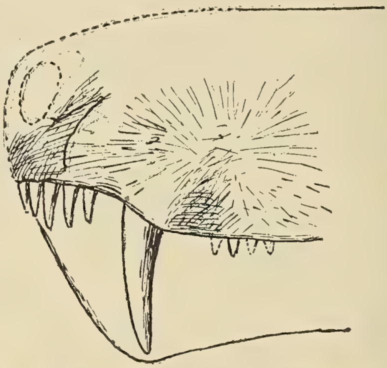

Fig. 15. *Scymnognathus minor* Broom. Type, No. 5535. × $\frac{2}{5}$. From Bull. Amer. Mus. Nat. Hist.

Scymnognathus whaitsi Broom 1912.

Type 5530 Nearly complete skull with part of left mandible.

Described and figured in Proc. Zool. Soc., 1912, p. 861, pl. xc, fig. 4.

Locality, Beaufort West commonage. Horizon, lower *Endothiodon* zone. Collector, J. H. Whaits.

5531 Greater part of the skull of *Scymnognathus whaitsi*, somewhat crushed from above downwards. The specimen shows the relations of the squamosal to the occiput, and reveals the fact that there is a large tabulare overlying the occipital part of the squamosal.

Locality, Beaufort West commonage. Horizon, lower *Endothiodon* zone. Collector, J. H. Whaits.

Topotype 5544 A much crushed but fairly complete skull.

Locality, Beaufort West commonage. Horizon, lower beds of *Endothiodon* zone. Collector, J. H. Whaits.

Topotype 5546 Snout of *Scymnognathus whaitsi* showing incisors and canines.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

ANOMODONTIA.

Cistecephalus microrhinus Owen 1876.

5318 Complete skull without mandible.
Locality, Nek at Kuilspoort. Horizon, *Cistecephalus* zone, near base. Collector, R. Broom.

Diælurodon whaitsi Broom 1911.

Type 5507 Nearly perfect skull, with mandibles attached.
Described and figured in Proc. Zool. Soc., 1911, p. 1075, pl. lxiii, figs. 6, 7.
Locality, Beaufort West commonage. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Paratype 5606 A badly weathered skull which shows the structure of the teeth better than any other known specimen. One tooth shows very beautifully the serrations of both the anterior and posterior borders.
Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Dicynodon bolorhinus (Broom) 1911.

Type 5505 Imperfect snout of small female.
Described and figured in Proc. Zool. Soc., 1911, p. 1076, pl. lxiii, fig. 10 (*Oudenodon*).
Locality, Nek at Kuilspoort, Beaufort West dist. Horizon, lowest beds of *Cistecephalus* zone. Collector, R. Broom.

Dicynodon ?bolorhinus Broom.

Figured 6156 Cast of brain case, vestibule, and cranial nerves of a species of *Dicynodon*, probably *D. bolorhinus*. The specimen has been described and figured in Proc. Zool. Soc., 1912, p. 419, pl. lvi, fig. 1–3.
Locality, Kuilspoort, Beaufort West dist. Horizon, *Cistecephalus* zone, lower beds. Collector, R. Broom.

Dicynodon feliceps Owen 1876.

5327 A complete but considerably crushed skull with a number of cervical vertebræ and the right shoulder girdle.

Locality, Kuilspoort, Beaufort West. Horizon, *Endothiodon* zone, about 400 ft. above Beaufort West township. Collector, R. Broom.

5583 Skull of *Dicynodon feliceps* Owen in fair condition with lower jaw in position.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5584 Snout of *Dicynodon feliceps* Owen showing section of anterior part of palate, with the relations of the prevomer and vomer. (Figured in Croonian Lecture, Phil. Trans., 1914.)

Locality, Kuilspoort. Horizon, *Endothiodon* zone. Collector, R. Broom.

5585–5590 Skulls of *Dicynodon feliceps* Owen, all in fairly good condition.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5533 Nearly complete skeleton of a small specimen of *Dicynodon feliceps*. Though the matrix is not very satisfactory the proportions of the animal can be very well seen.

The skull is well preserved though crushed. The right limb and shoulder girdle are underneath the somewhat confused mass of bones in the shoulder region. The left humerus, radius and ulna are placed by the side with the top of the humerus close to the glenoid cavity. The hind limbs are doubled on themselves but in natural relations to the pelvis.

The specimen is of value as showing not only the proportions of the head, body and limbs but as showing the position of the shoulder girdle and to some extent of the hind limbs.

The following are the principal measurements:

Probable total length from snout to tip of tail	500	mm.
Length of skull	113	“
“ “ humerus	53	“
“ “ radius	35	“
“ “ femur	63	“

Locality, Beaufort West commonage. Horizon, lower beds of *Endothiodon* zone. Collector, J. H. Whaits.

Dicynodon ictidops Broom 1913.

Type Complete skull with mandibles in position.
5510 Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 446, figs. 5, 6.

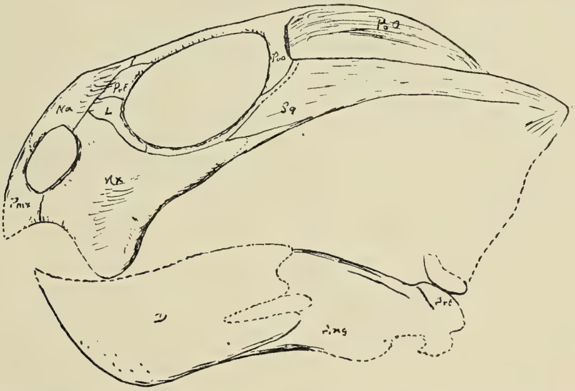
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Fig. 16. *Dicynodon ictidops* Broom. Type, No. 5510. Natural size. (From Bull. Amer. Mus. Nat. Hist.)

Locality, Beaufort West commonage. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Dicynodon laticeps Broom 1912.

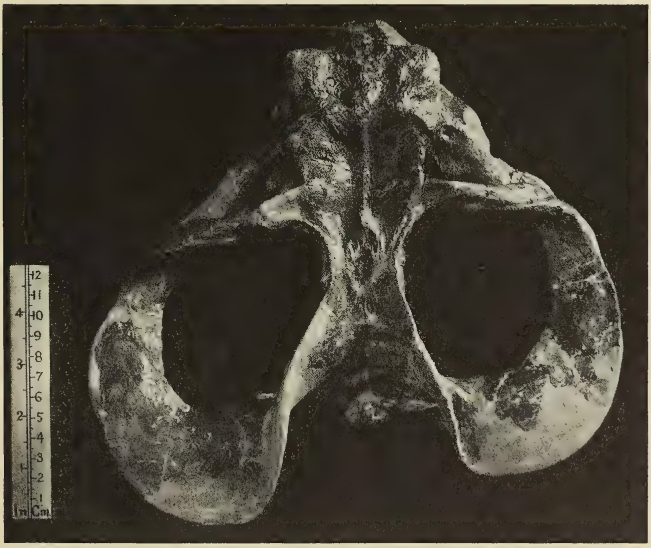
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Fig. 17. *Dicynodon laticeps* Broom. Type, No. 5564. (From Amer. Mus. Journ.)

Type 5564	A finely preserved skull of a male, with the tusks broken off. Described and figured in Proc. Zool. Soc., 1912, p. 868, pl. xcii, figs. 12, 13. Also figured in Amer. Mus. Journ., Vol. XIV, p. 142, April, 1914. Locality, Nieuwveld. Horizon, ?. Collector, J. H. Whaits.

Dicynodon leoniceps Owen 1876.

5304	Skull of a young individual, apparently of *Dicynodon leoniceps* Owen, in fairly good condition. Locality, Oudeberg, Graaff Reinet dist. Horizon, top of *Endothiodon* zone. Collector, R. Broom.

Dicynodon leontops Broom 1913. (Figs. 18, 19.)

Type 5582	Almost perfect skull with lower jaws and a series of 10 vertebræ. The tusks are perfect and show internal wearing by friction of the jaws and external wearing by friction with the ground.

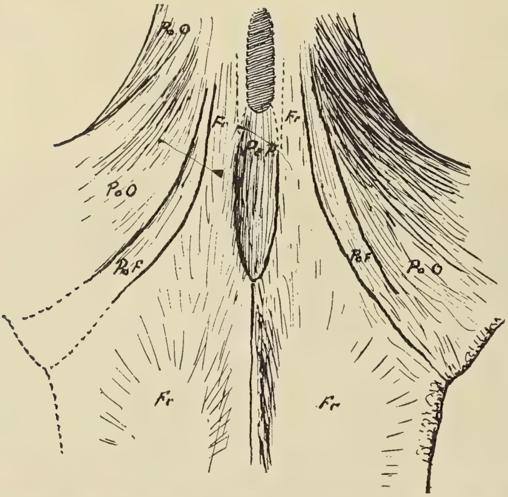

Fig. 18. Preparietal region in *Dicynodon leontops* Broom. Type, No. 5582. × $\frac{4}{5}$. (From Bull. Amer. Mus. Nat. Hist.)

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 451, fig. 12. Also Amer. Mus. Journ., Vol. XIV, p. 143, April, 1914.

Locality, Bethulie, Orange Free State. Horizon, top of *Cistecephalus* zone. Collector, R. Broom.

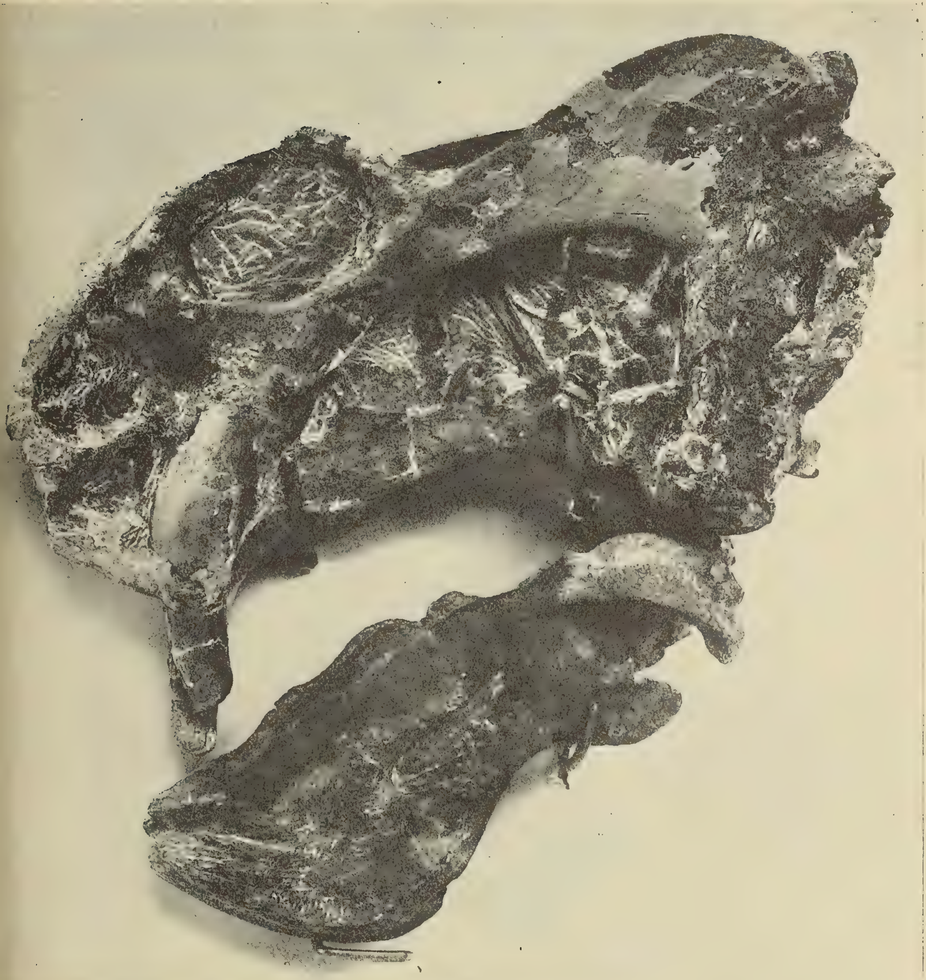

Fig. 19. *Dicynodon leontops* Broom. Type, No. 5582. About one-third natural size. (From Amer. Mus. Journ.)

Dicynodon lissops Broom 1913. (Fig. 20.)

Type 5508	A nearly complete but somewhat crushed skull. Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 450, fig. 11. Locality, Wilgebosch, near New Bethesda, Cape Colony. Horizon, *Cistecephalus* zone, about 900 ft. above the hori-

zon of New Bethesda township, and probably within 300 ft. of the limit of the *Cistecephalus* zone. Collector, R. Broom.

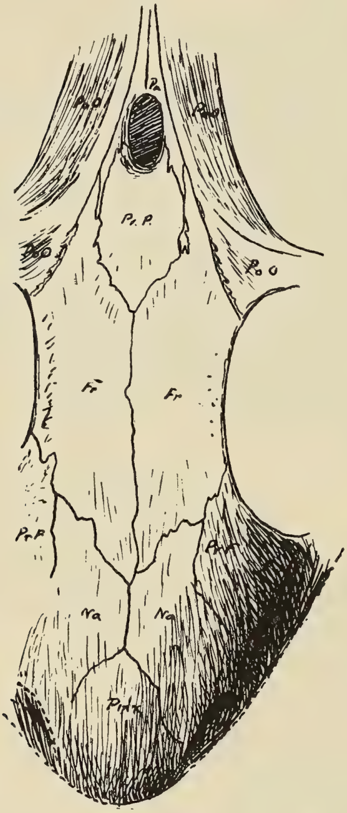

Fig. 20. *Dicynodon lissops* Broom. Type, No. 5508. Natural size. (From Bull. Amer. Mus. Nat. Hist.)

Dicynodon lutriceps Broom 1912.

Type 5501 — Nearly complete skull but lacking mandible and arches. The occiput, though the contact with front of the skull is lost, is of the same individual.

Described and figured in Proc. Zool. Soc., 1912, p. 870, pl. xcii, figs. 14–16.

Locality, Kuilspoort, 2 miles east of house. Horizon, *Endothiodon* zone, about 300 ft. above Beaufort West. Collector, R. Broom.

Dicynodon moschops Broom 1913. (Figs. 21, 22, 23.)

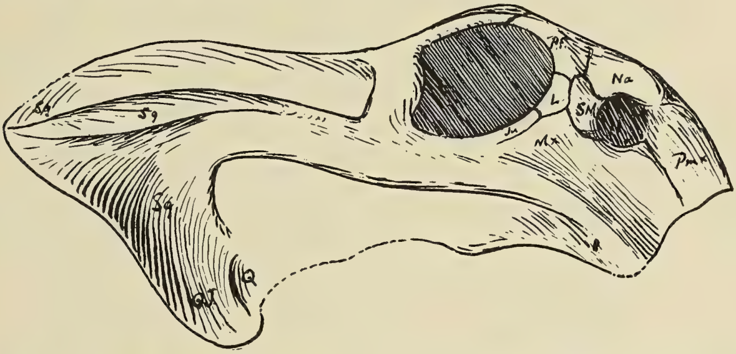

Fig. 21. *Dicynodon moschops* Broom. Type, No. 5325. × $\frac{3}{7}$. (From Bull. Amer. Mus. Nat. Hist.)

Type 5325 A nearly complete skull of a female.

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 447, figs. 7, 8. Also in Amer. Mus. Journ., vol. XIV, p. 141, April, 1914.

Locality, Oudeberg, Graaff Reinet district. Horizon, ?. Collector, R. Broom.

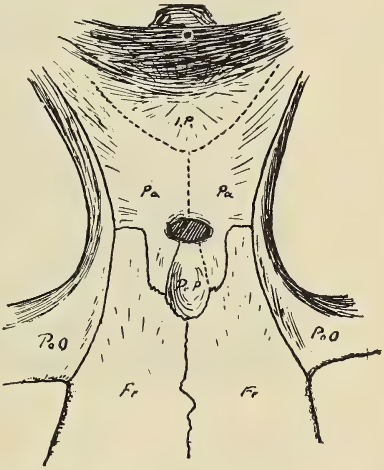

Fig. 22. The pineal foramen and its relations in *Dicynodon moschops* Broom. Type, No. 5325. About $\frac{1}{2}$ nat. size. (From Bull. Amer. Mus. Nat. Hist.)

Dicynodon planus Broom 1913. (Figs. 24, 25.)

Type 5549 Complete skull, without mandibles, of moderate sized broad-headed *Dicynodon.*

Described and figured in Bull. Am. Mus. Nat. Hist., Vol. XXXII, 1913, p. 452, figs. 13, 14.

Locality, Kuilspoort, Beaufort West dist. Horizon, *Endothiodon* zone, near top. Collector, R. Broom.

Dicynodon platyceps Broom 1913. (Figs. 26, 27.)

Type 5542 Complete skull, with mandibles, of a moderately large *Dicynodon.* The sutures are very beautifully shown. The occiput shows the small tabulare. The specimen is a female and no trace of a tusk can be seen.

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 444, fig. 4. Also Amer. Mus. Journ., Vol. XIV, p. 136, April, 1914.

Locality, New Bethesda, Cape Colony. Horizon, probably the Middle *Cistecephalus* zone. Collector, R. Broom.

Topotype 5545 Greater part of a skull of an animal about the same size as the type. The specimen has been broken across in various directions to show the structure of the vomer and fused prevomers. The true vomer is seen to be present as a long trough-like bone lying above the large fused prevomers.

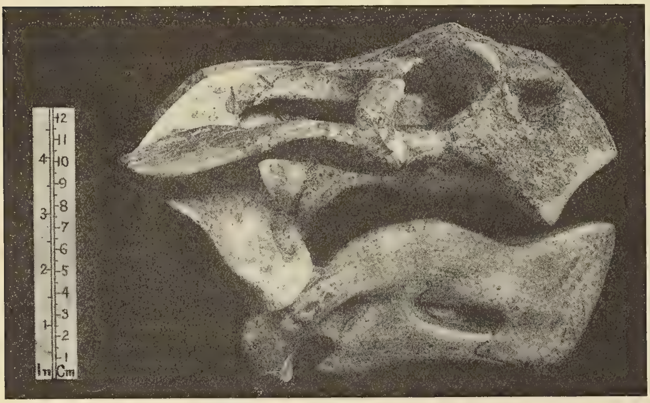

Fig. 23. *Dicynodon moschops* Broom. Type, No. 5325. The lower jaw is restored. (From Amer. Mus. Journ.)

The specimen is being figured in my Royal Society Croonian Lecture.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

5575 A perfect skull of a flat-headed *Dicynodon* which is probably a young *D. platyceps*. It was obtained in the same locality and from the same stratum as the type.

It measures 140 mm. in greatest length and 106 mm. in greatest width. There is a pair of small tusks which project mainly forwards, though this may be due to crushing in part.

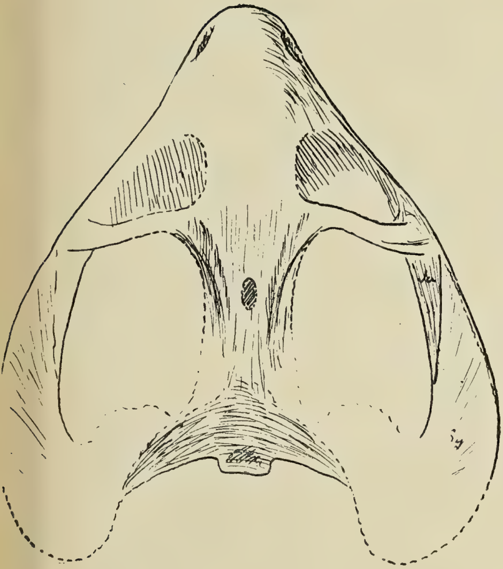

Fig. 24.

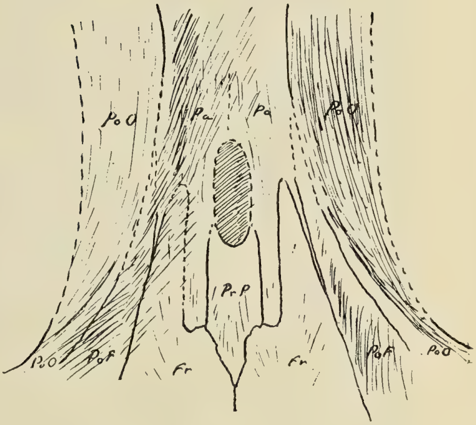
Po.O
Pa
Pa
Po.O
Pr.P
Po.O
Po.f
Fr
Fr
Po.f
Po.O

Fig. 25.

Fig. 24. Skull of *Dicynodon planus* Broom. Type, No. 5549. × about $\frac{2}{7}$.
Fig. 25. Preparietal region of same specimen. Natural size. (From Bull Amer. Mus. Nat. Hist.)

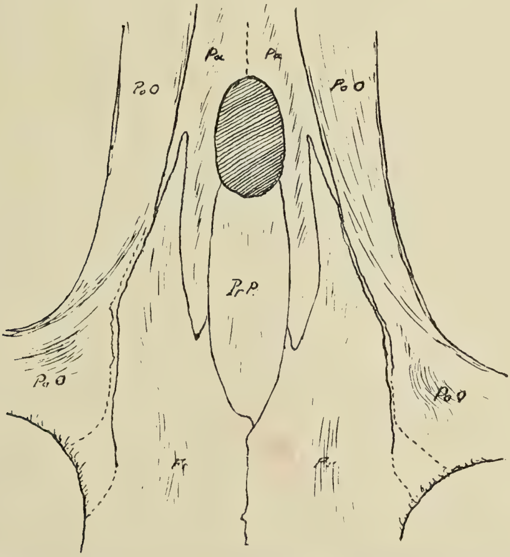
Pa
Pa
Po.O
Po.O
Pr.P
Po.O
Po.O
Fr
Fr

Fig. 26. The relationships of the preparietal in *Dicynodon platyceps* Broom. Type, No. 5542. Natural size. (From Bull. Amer. Mus. Nat. Hist.)

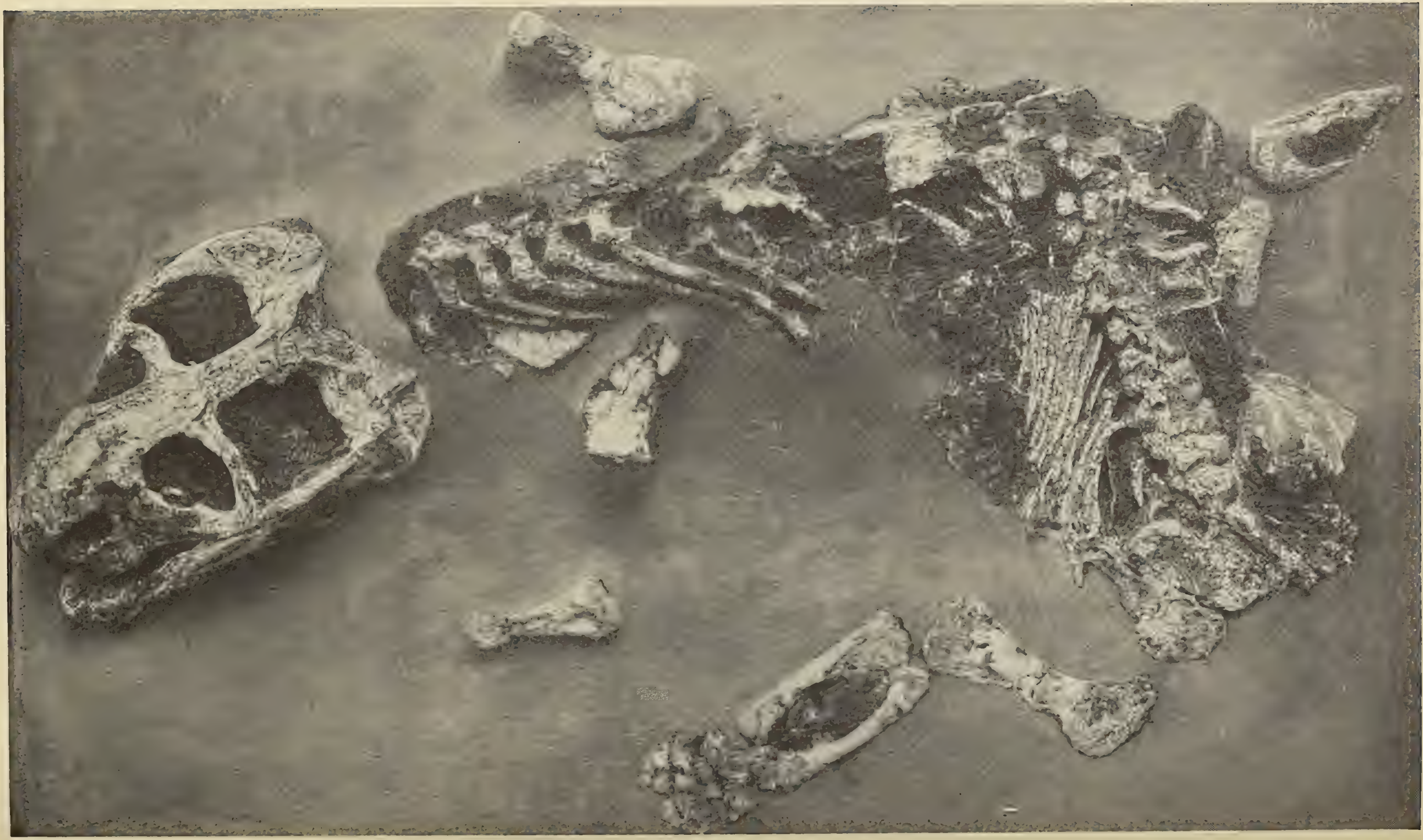

Fig. 27. Skull of *Dicynodon platyceps* Broom. Type, No. 5542. $\times \frac{1}{5}$. Skeleton in doubtful association. (From Amer. Mus. Journ)

The preparietal is relatively rather wider than in the type, but in other respects the agreement of the bones is close.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

5576 Somewhat crushed but nearly complete skull of a small *Dicynodon,* probably *D. platyceps.* It has a pair of fairly well developed tusks.

The greatest length of the skull is about 105 mm.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

Dicynodon psittacops Broom 1912.

Type 5534 Nearly complete skeleton of a small *Dicynodon.* As the girdles and skull are all in undisturbed position the natural relations of these parts is clearly indicated. The left arm is bent much to the front and disarticulated.

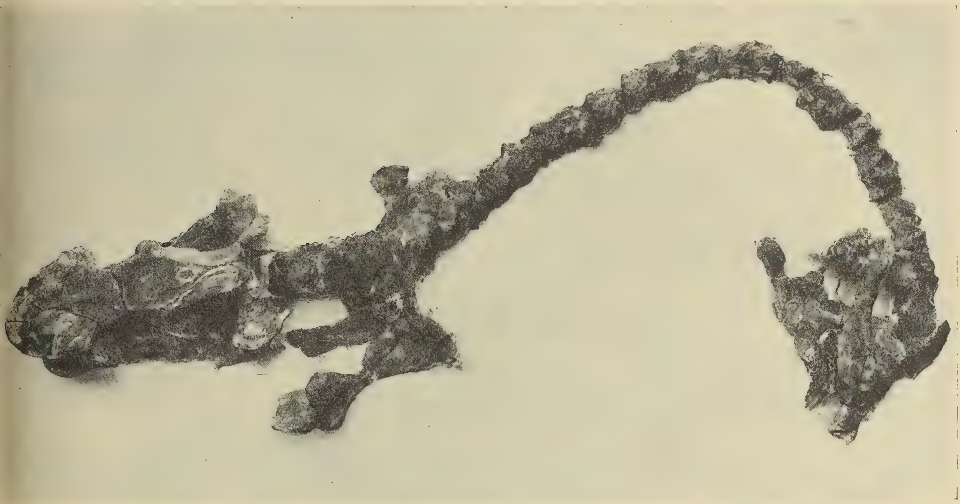

Fig. 28. *Dicynodon psittacops* Broom. Type, No. 5534. About one-third natural size. (From Amer. Mus. Journ.)

The following are the principal measurements of the specimen.

Probably total length from snout to tip of tail	490	mm.
Length of skull	102	"
" " humerus	about 47	"
" " femur	57	"

The skull has been described and figured in Proc. Zool. Soc., 1912, p. 869, pl. xcii, fig. 17. Also Amer. Mus. Journ., vol. XIV, p. 141, April, 1914.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Dicynodon ?psittacops Broom.

5609 A nearly complete skeleton of a small *Dicynodon*. The skull agrees so closely with *D. psittacops* that I hesitate to make it a different species, still the skull is relatively distinctly larger in the present specimen, and the horizon from which it comes is lower.

Locality, Grootfontein, Beaufort West dist. Horizon, lower *Endothiodon* zone. Collector, J. H. Whaits.

Dicynodon (Kannemeyeria) simocephalus Weithofer 1888.

5591–93 Portions of skeletons of three individuals of about the same size. One (5591) has preserved most of the antorbital portion of the skull with the bases of the tusks.

Locality, Winnaarsbaken Burghersdorp dist. Horizon, lower beds of *Cynognathus* zone. Collector, R. Broom.

Dicynodon strigops Broom 1913. (Fig. 29.)

Type 5581 An imperfect skull of a small Dicynodon. The front of the snout is lost, and much of the occiput and zygomatic arches are weathered off but the middle portion of the skull is well preserved and all the sutures of the frontal and preparietal regions clearly seen.

Described and figured in Rec. Albany Mus., Vol. II, 1913, p. 400.

Locality, Harrismith, Orange Free State. Horizon, doubtful but probably Triassic. Collector, unknown.

Dicynodon tylorhinus Broom 1913. (Figs. 30, 31.)

Type 5511 Front half of skull, somewhat crushed from above, with much of occiput.

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 448, figs. 9, 10.

Locality, Wilgebosch, near New Bethesda. Horizon, upper part of *Cistecephalus* zone probably about 900 ft. above

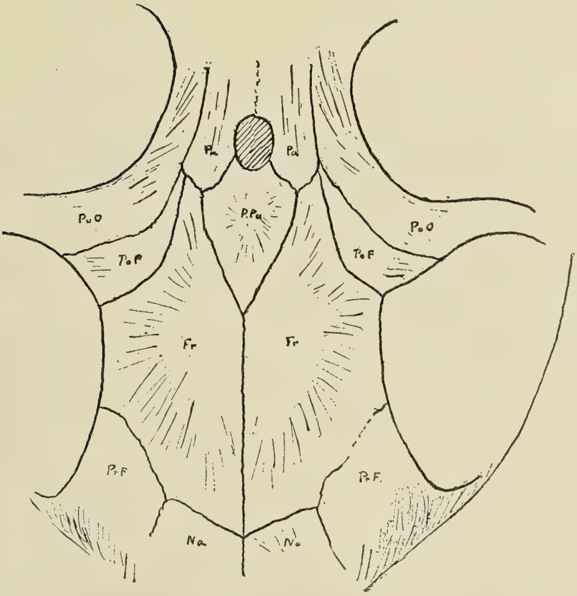
Pa
Pa
P.Pa
Po O
Po O
Po F
Po F
Fr
Fr
Pr F
Pr F.
Na
Na

Fig. 29. Top of skull of *Dicynodon strigops* Broom. Type, No. 5581. Natural size.

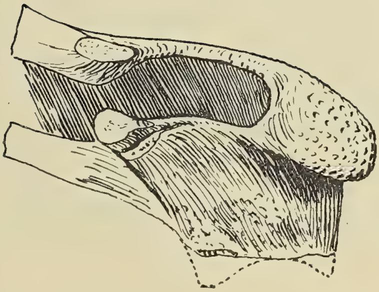

Fig. 30.

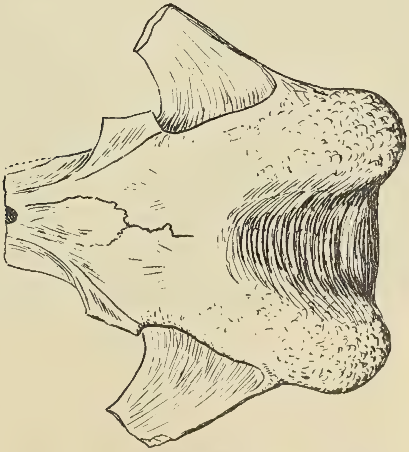

Fig. 31.

Fig. 30. Side view of snout of *Dicynodon tylorhinus* Broom. Type, No. 5511. × ½.
Fig. 31. Upper view of same specimen. × ½. (From Bull. Amer. Mus. Nat. Hist.)

the horizon of New Bethesda township. Collector, R. Broom.

5580 A much crushed and imperfect skull probably of *D. tylorhinus*, considerably smaller in size than the type. There is no evidence of tusks and the caniniform processes come to a very sharp point.
Locality, Wilgebosch, New Bethesda dist. Horizon, upper *Cistecephalus* zone, about same level as type. Collector, R. Broom.

Dicynodon whaitsi Broom 1913. (Figs. 32, 33.)

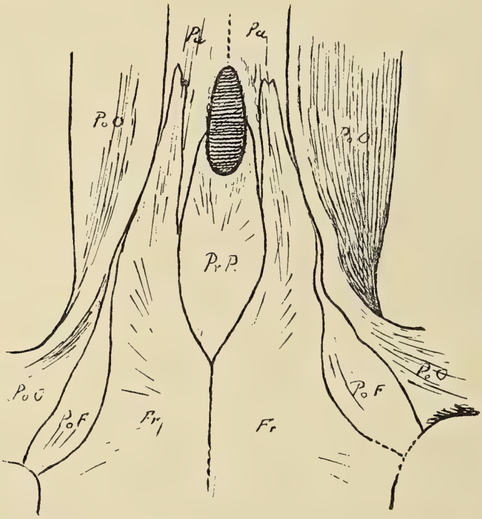

Fig. 32. Parietal region in *Dicynodon whaitsi* Broom. Type, No. 5566. × ½. (From Bull. Amer. Mus. Nat. Hist.)

Type 5566 Anterior portion of a skull and mandible in fine preservation. Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 443, fig. 3. Also Amer. Mus. Journ., Vol. XIII, p. 343, December, 1913.
Locality, Nieuwveld. Horizon, ?. Collector, J. H. Whaits.

Dicynodon sp. (Fig. 34.)

Figured 5532 Nearly complete skeleton of a small *Dicynodon*. The skull is not in a very satisfactory condition, the front part having been in such a rotten condition that it was impossible to save it, and the bone of the top does not show the sutures satisfactorily, so that the species must for the present remain in doubt. Possibly it may be a young specimen of *Dicynodon planus.* As preserved there has been much crushing of the skull so that the tusk is curved considerably backwards. The frontal region is fairly wide and the parietal nearly as wide.

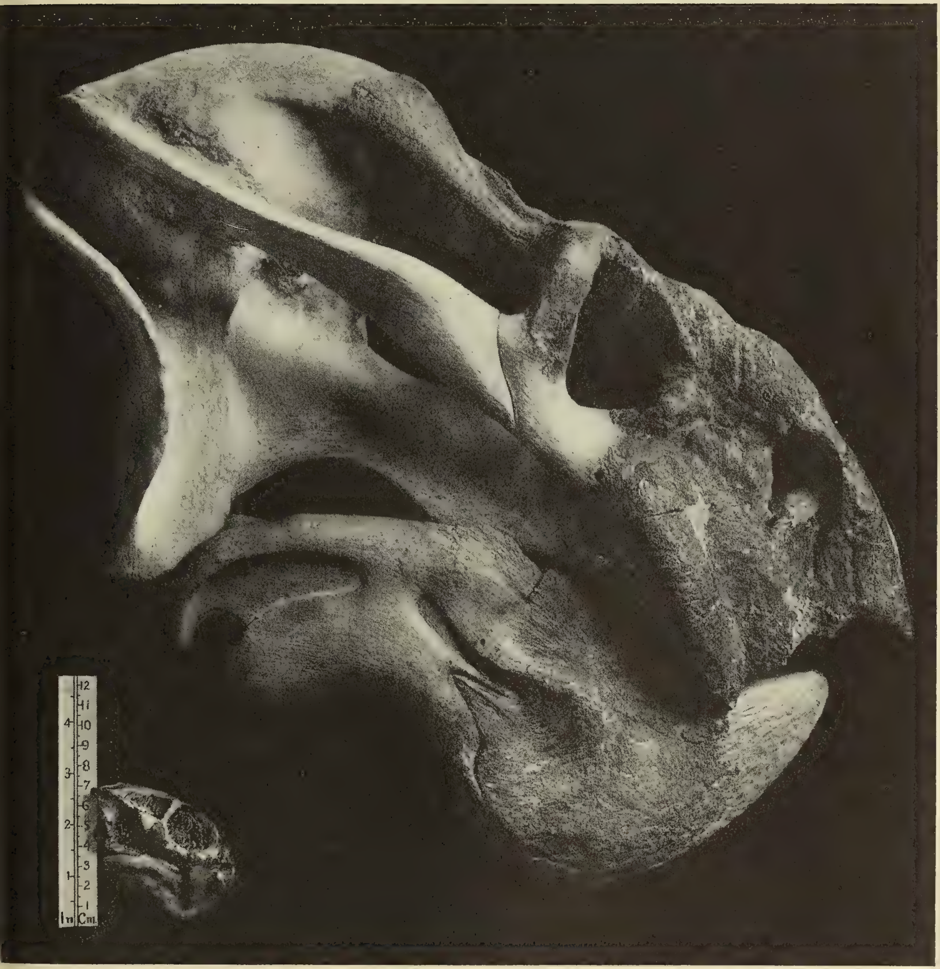

Fig. 33. Larger skull, *Dicynodon whaitsi* Broom. Type, No. 5566.
Smaller skull, *Diictodon galeops* Broom. Type, No. 5308. (From Amer. Mus. Journ.)

There are 28 presacral vertebræ, and the photograph shows them as they were found in the shale. The specimen thus gives a good idea of the general proportions of at least one species of *Dicynodon.*

The following are some of the chief measurements.

Probably greatest length of skeleton from snout to tip of tail	600	mm.
Length of skull	115	“
Vertebral column (1st to 28th)	390	“
Length of humerus	58	“
“ “ radius	38	“
“ “ femur	73	“
“ “ tibia	56	“

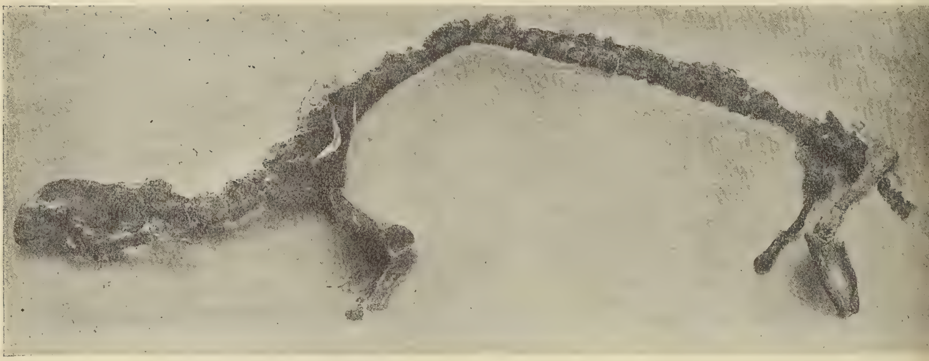

Fig. 34. *Dicynodon ?planus.* No. 5532. About $\frac{1}{4}$ natural size. (From Amer. Mus. Journ.)

Figured in Amer. Mus. Journ., Vol. XIV, p. 142, April, 1914.

Locality, Nek at Kuilspoort, Beaufort West dist. Horizon, lower beds of *Cistecephalus* zone. Collector, R. Broom.

5302 Portion of skeleton of small Anomodont. There is seen the back half of the skull, the greater part of the cervical and dorsal region with most of the left shoulder girdle and arm, and also much of the left pes. The specimen is of value through showing the scapula, coracoid and precoracoid, with the clavicle and cleithrum in position, being, so far as I am aware, the only specimen of *Dicynodon* which shows the latter. The cleithrum is a slender bone which lies along the anterior border of the scapula and extends from the upper end to narrowest part of the scapula above the acromion. The clavicle in the specimen extends upwards to the acromion and lying along the upper edge of the acromion reaches almost to the lower end of the cleithrum.

Locality, unknown, possibly Graaf Reinet dist. Horizon, unknown. Collector, unknown.

5601 Imperfect preorbital portion of skull of large flat-headed *Dicynodon,* very probably a new species.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

Diictodon galeops Broom 1913. (Figs. 33, 35.)

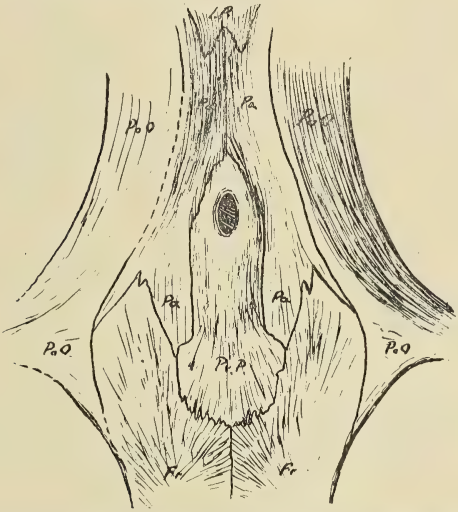

Fig. 35. Parietal region in *Diictodon galeops* Broom. Type, No. 5308. Twice natural size. (From Bull. Amer. Mus. Nat. Hist.)

Type 5308 Complete skull without mandible.

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 453, fig. 15. Also Amer. Mus. Journ., Vol. XIII, p. 343, December, 1913.

Locality, Slachter's Nek, Cape Colony. Horizon, probably upper part of *Endothiodon* zone. Collector, R. Broom.

Emydops longiceps Broom 1913. (Fig. 36.)

Type 5578 Nearly perfect skull which forms the type of *E. longiceps.*

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 455, fig. 17.

Locality, Lemoenfontein, Beaufort West dist. Horizon, upper *Endothiodon* zone. Collector, J. H. Whaits.

Emydops minor Broom 1912. (Figs. 37, 43.)

Type 5525 Nearly complete but somewhat crushed skull with mandibles in position.

Described and figured in Proc. Zool. Soc., 1912, p. 871, pl. xciii, fig. 20. Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 454, fig. 16. Also Amer. Mus. Journ., Vol. XIII, p. 342, December, 1913.

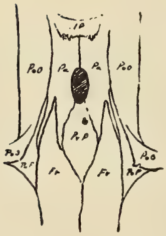

Fig. 36.

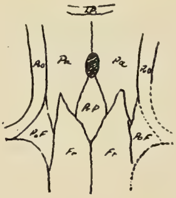

Fig. 37.

Fig. 36. Parietal region in *Emydops longiceps* Broom. Type, No. 5578. Natural size. (From Bull. Amer. Mus. Nat. Hist.)

Fig. 37. Parietal region in *Emydops minor* Broom. Type, No. 5525. × $\frac{6}{5}$. (From Bull. Amer. Mus. Nat. Hist.)

Locality, Kuilspoort. Horizon, *Endothiodon* zone, about 1000 ft. above Beaufort West, and in the same beds occurs *Taognathus megalodon*. Collector, R. Broom.

Emydorhynchus palustris Broom 1913. (Fig. 38.)

Type 5512 Complete skull without mandibles, somewhat weathered.

Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 456, fig. 19.

Locality, New Bethesda, Cape Colony. Horizon, *Cistecephalus* zone. Collector, R. Broom.

5539 Considerable portion of anterior half of skeleton, showing the feebly ossified condition of the shoulder girdle and bones of fore limb.

Locality, New Bethesda. Horizon, *Cistecephalus* zone, probably about middle beds. Collector, R. Broom.

5540 Portion of a second skeleton showing portions of pelvis and hind limbs. This specimen was found about a yard from specimen No. 5539 and is possibly of the same individual.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

5632 Skull of *Emydorhynchus palustris* Broom cut into thin slices and showing beautifully the internal structure.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

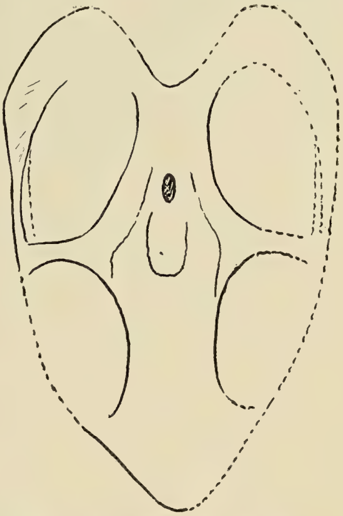

Fig. 38. *Emydorhynchus palustris* Broom. Type, No. 5512. Natural size. (From Bull. Amer. Mus. Nat. Hist.)

Endothiodon bathystoma Owen 1876.

5614 Nearly perfect skull with mandibles attached and the upper cervical vertebræ. In the general structure of the skull the agreement with Owen's type is such as to render it probable that the present is the same species. On the other hand there is considerable difference in the dentition In the mandible there are 4 teeth well forward which occupy 26 mm. These are followed by a space of about 72 mm. in which there is no trace of teeth, and behind this are 3 small teeth. It seems not improbable that the condition may be due to age. In the upper jaw the teeth are also in part lost from the middle of the dental series though one or two remaining are fairly large and show a fair agreement with those of Owen's type.

The principal measurements of the skull are: —

Basal length	300	mm.
Interorbital width	118	"
Orbit to front of snout	160	"
Dental series	about 120	"

Locality, Beaufort West. Horizon, upper *Endothiodon* zone. Collector, J. H. Whaits.

Endothiodon paucidens sp. nov.

Type 5572 A nearly complete skull, without mandible, of a large *Endothiodon.* A year ago I showed that the genus *Endothiodon* must be subdivided as there are very different types of teeth in known species, and accepted Seeley's genus *Esoterodon* for *Endothiodon uniseries* Owen, and proposed a new genus *Emydochampsa* for *Endothiodon platyceps.* Unfortunately it will be necessary for a time to go back to the old genus *Endothiodon* for two reasons. In the first place nearly every specimen of *Endothiodon* has the crown of the teeth broken off and it is thus impossible to place such types as *Endothiodon whaitsi* or the present species, and secondly the teeth of *Endothiodon bathystoma,* the type species, are unknown. Seeley described and figured (Q. J. G. S., Vol. XLVIII, 1892, p. 476, figs. 1, 2) a lower jaw which he believed to be *Endothiodon bathystoma* and

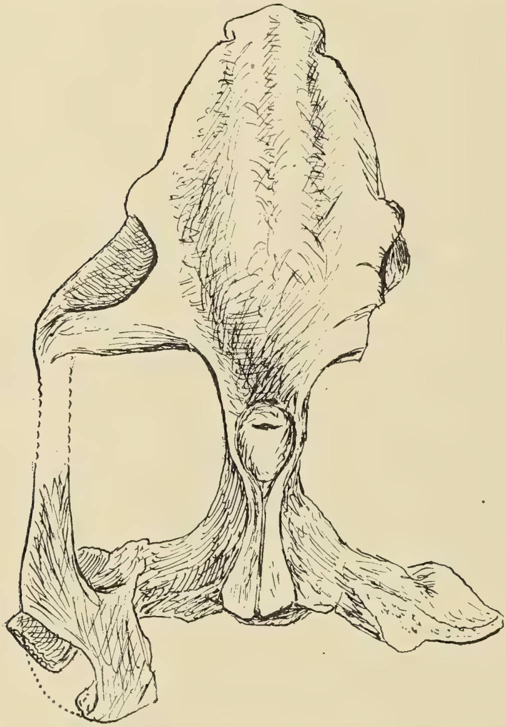

Fig. 39. Skull of *Endothiodon paucidens* Broom. Type, No. 5572. × $\frac{1}{4}$.

as this showed the crown of the teeth the characters were taken from Seeley's account. On examining this jaw which is now in the British Museum I came to the conclusion that it is a very different species from Owen's *E. bathystoma,* and as it is quite unlike any other known forms I have much pleasure in calling it *Endothiodon seeleyi.*

The skull which I make the type of *Endothiodon paucidens* differs from *E. uniseries* and *E. whaitsi* in being broad and moderately flat. The snout has the three longitudinal ridges seen in all known species. The postorbital arches pass outwards and slightly downwards as in the flat-headed Dicynodons and from the outer end of the arch the zygoma passes nearly directly backwards. The parietal crest is very narrow and only slightly elevated from the frontal surface. The pineal foramen is small and situated in the middle of a large oval boss which is possibly all formed by the preparietal.

The teeth are mostly lost from the specimen but the sockets show that there have been 9 large teeth in a single row. The whole series measures 80 mm.

The greatest length of the skull is	350	mm.
“ “ width “ “ “ “	290	“
“ basal length “ “ “ “	320	“
“ interorbital width “ “ “	110	“

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5573 A fairly good skull of *Endothiodon paucidens* which lacks mandibles, the parietal region, and most of the occiput and arches of the right side.

Four large teeth are preserved, two on each side but the crowns are lost. There are evidences of 9 teeth and the space occupied by them is 73 mm.

The interorbital width is 98 mm.

Though this skull is smaller than the type the proportions agree so closely as to have little doubt that it is either a younger specimen or a female.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5574 An imperfect skeleton which shows the palate in fairly good condition. Much of the occiput is also preserved and most of the parietal crest.

The following are some of the principal measurements: —

Basal length	288 mm.
Dental series	about 75 "

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Endothiodon (Emydochampsa) platyceps Broom 1912.

Type 5570 Nearly perfect skull with mandibles attached, somewhat weathered. The bones of the skull are remarkably spongy and where the surface is gone the bone appears to have weathered rapidly.

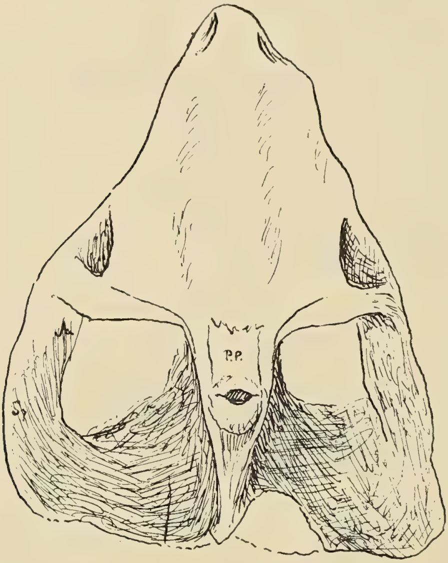

Fig. 40. Skull of *Endothiodon (Emydochampsa) platyceps* Broom. Type, No. 5570. $\times \frac{1}{4}$.

Described and figured in Proc. Zool. Soc., 1912, pp. 867, 875, pl. xciii, fig. 19.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Paratype 5571 — Nearly complete skull which shows most of the nasal and frontal regions which are lost from the type, but does not show the teeth so satisfactorily.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Endothiodon ?seeleyi Broom.[1]

5615 — Nearly perfect mandibles of a broad-headed *Endothiodon.* The species is very doubtful but the large number of small teeth arranged irregularly in more than one row suggests that it may be identical with the jaw described by Seeley as *E. bathystoma* but which is, in my opinion, not *E. bathystoma* Owen but a distinct species.

Locality, Beaufort West dist. Horizon, middle *Endothiodon* zone. Collector, J. H. Whaits.

Endothiodon uniseries Owen 1879. (Figs. 41, 42.)

Figured 5612 (Fig. 41) — A beautiful skull in almost perfect condition but lacking one side of the occiput. The mandibles are in contact and nearly perfect.

Figured in Amer. Mus. Journ., Vol. XIII, p. 341, December, 1913.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Figured 5613 (Fig. 42) — The greater part of the skeleton of an *Endothiodon uniseries* Owen. The skull is imperfect and considerably crushed but almost all of the palate is preserved and the contact complete from the premaxilla to the occiput. The frontal region is preserved and the left mandible is in perfect condition. All the vertebræ are preserved from the axis to the sacrum, the total presacral number with the atlas being 28. Almost all the ribs of the left side are preserved but owing to the heads being in contact with the vertebræ and the vertebræ being considerably distorted by crushing it has been necessary to mount the body with the ribs considerably flattened. In life the body must have been at least as broad as deep, perhaps broader. The left scapula is of the same individual but the precoracoid is from another individual as are also the humerus and femur. The left ilium is restored from the right which is mounted in position. Parts of both femora belonging to the individual have been preserved, but so badly crushed that it seemed better to place in the skeleton the uncrushed complete thigh bone of another specimen of the same species. The radius and ulna are of the same individual but belong to the right side as, however, they are extremely crushed the fact of their being of the right side does not make much difference. The bones of the front and hind feet each belong to one foot but there is no absolute certainty as to the positions of the relative bones.

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[1] See p. 149.

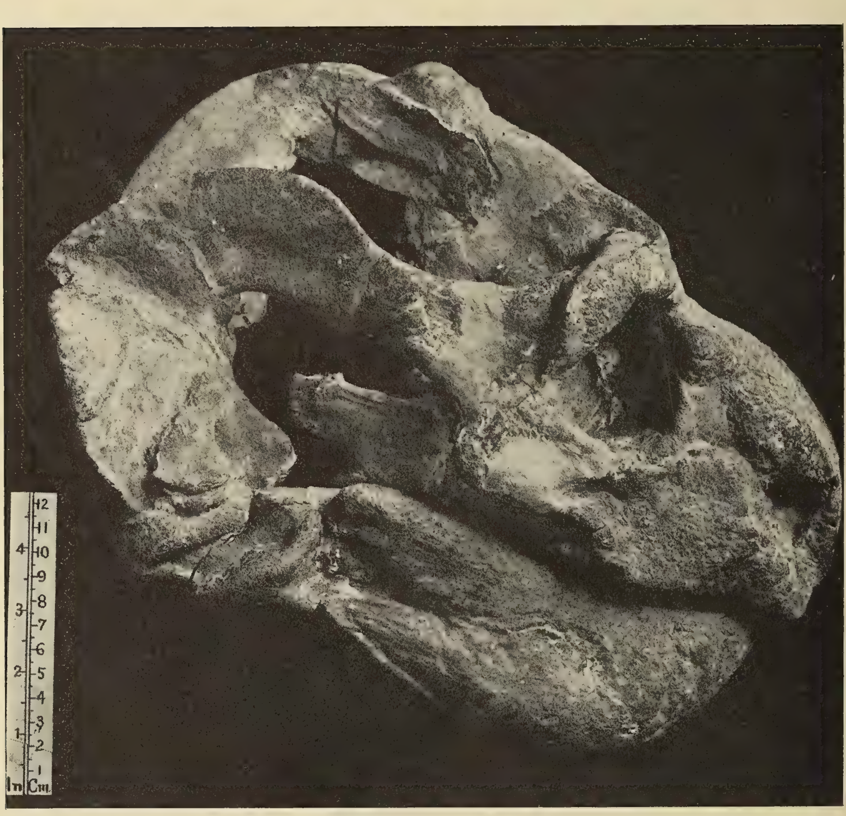


Fig. 41. *Endothiodon uniseries* Owen. No. 5612. (From Amer. Mus. Journ.)

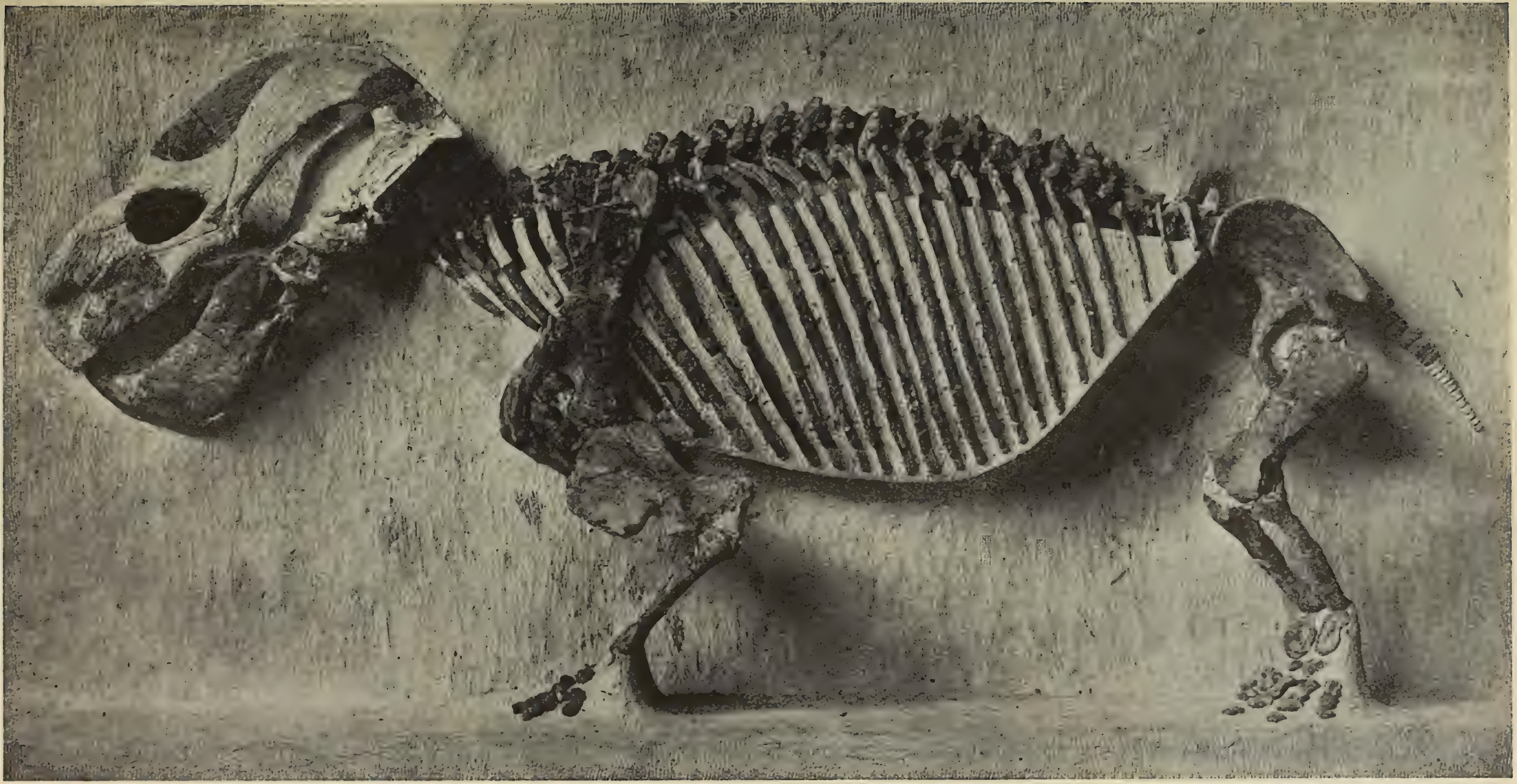


Fig. 42. *Endothiodon uniseries* Owen. No. 5613. × $\frac{1}{6}$. (From Amer. Mus. Journ.)

Figured in Amer. Mus. Journ., Vol. XIII, p. 340, December, 1913.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5334 Nearly complete skeleton with skull of *Endothiodon uniseries* Owen. The skull and skeleton are both much crushed but otherwise most of the remains are in good condition.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Endothiodon whaitsi Broom 1912. (Fig. 43.)

Type 5565 A finely preserved skull and mandible with a few vertebræ, ribs and limb bones in association.

Described and figured in Proc. Zool. Soc., 1912, p. 866, pl. xciii, fig. 18. Also Amer. Mus. Journ., Vol. XIII, p. 342, December, 1913.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Endothiodon sp.

5603 The greater part of the skeleton of a species of *Endothiodon.* The skull is much crushed and imperfect in front and the matrix so impregnated with lime as to make it difficult to separate it from the bones. Most of the vertebræ and ribs are preserved and much of the girdles and limbs.

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5616 Mandible of a very large *Endothiodon* which probably belongs to a new species. The whole mandible measures 385 mm. in length. It seems to agree pretty closely with *E. paucidens* Broom in having only a single row of teeth and in other respects. The teeth, however, are smaller and further apart and it is possible that the specimen may be an aged *E. paucidens.*

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5618 Occiput of a large species of Endothiodon, probably *E. paucidens* Broom.

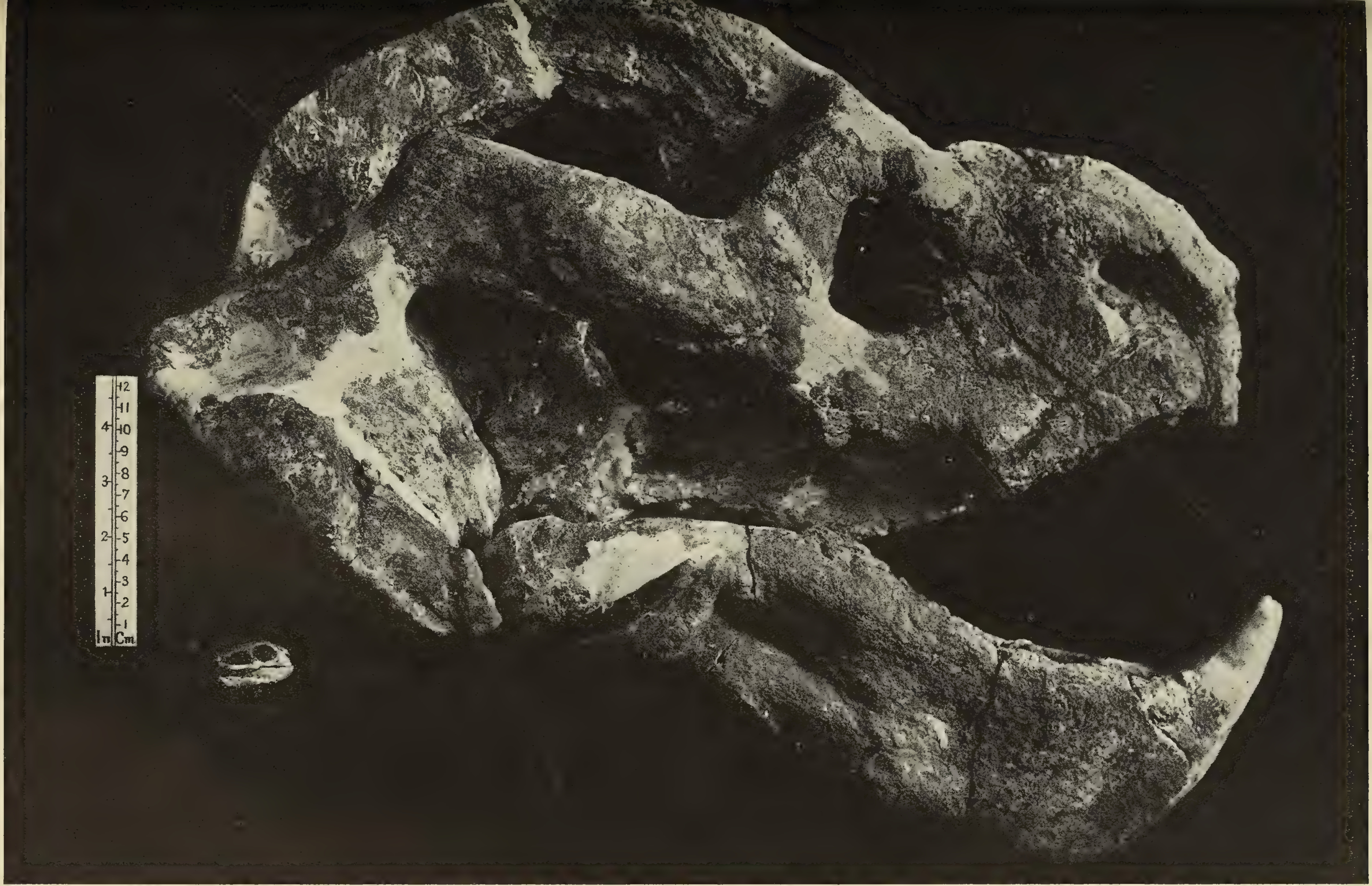


Fig. 43. Larger skull, *Endothiodon whaitsi* Broom. Type, No. 5565.
Smaller skull, *Emydops minor* Broom. Type, No. 5525. (From Amer. Mus. Journ.)

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

5617 Considerable part of the skull of a small, probably half grown, *Endothiodon uniseries* or *E. whaitsi.*

Locality, Beaufort West. Horizon, *Endothiodon* zone. Collector, J. H. Whaits.

Lystrosaurus latirostris (Owen) 1860.

5600 Crushed but excellent skull of a species of *Lystrosaurus*, probably *L. latirostris* Owen, with shoulder girdle and many vertebræ and ribs.

Locality, Smithfield, Orange Free State. Horizon, *Lystrosaurus* zone. Collector, D. R. Kannemeyer.

Lystrosaurus ?latirostris (Owen).

5627 Fairly good skull of a young individual of probably *L. latirostris* Owen.

Locality, Harrismith. Horizon, *Lystrosaurus* zone. Collector, A. van der Poel.

Lystrosaurus ?murrayi (Huxley) 1859.

Figured 5629 Snout of a small *Lystrosaurus.* The specimen though imperfect is of historical interest as being that which first revealed the structure of the beak and of the front of the palate.

Described and figured in Trans. S. Afr. Phil. Soc., Vol. XI, 1900, p. 169, pl. xxv, figs. 1, 2 (*Ptychosiagum*).

Locality, unknown. Horizon, *Lystrosaurus* zone or possibly *Procolophon* zone. Collector, unknown.

Pristerodon mackayi Huxley 1868.

5307 Complete skull with lower jaw.

Locality, Victoria West, Cape Colony. Horizon, probably *Pareiasaurus* zone. Collector, T. J. R. Scholtz.

Prodicynodon beaufortensis Broom 1912.

Type 5509 Front half of a much crushed skull.

Described and figured in Proc. Zool. Soc., 1912, p. 867, pl. xciii, fig. 21.

Locality, Kuilspoort, Beaufort West dist. Horizon, *Endothiodon* zone, probably about 1000 ft. above the horizon of Beaufort West township. Collector, R. Broom.

Taognathus megalodon Broom 1911.

Type 5523 Imperfect middle portion of skull with mandibles attached. A remarkable type of Anomodont with broad powerful mandibles which have a few large teeth.

Described and figured in Proc. Zool. Soc., 1911, p. 1076, pl. lxii, figs. 2–4.

Locality, Kuilspoort, Beaufort West dist. Horizon, ?. Collector, R. Broom.

CYNODONTIA.

Bauria cynops Broom 1909.

Figured 5622 Nearly perfect skull of *Bauria cynops* Broom with a few associated limb bones.

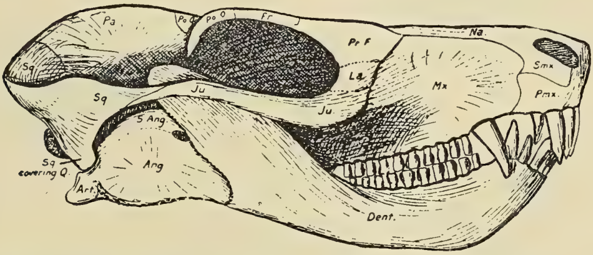


Fig. 44. *Bauria cynops* Broom. No. 5622. × about ½. (From Amer. Mus. Journ.)

Figured in Amer. Mus. Jour., Vol. XIII, p. 346, December, 1913.

Locality, Winnarsbaken. Horizon, Lower *Cynognathus* zone. Collector, R. Broom.

Diademodon browni Seeley 1894.

5621 Nearly perfect skull with associated remains of a species of *Diademodon* which agrees sufficiently with *D. browni* Seeley to be provisionally referred to that species.

Locality, Winnarsbaken. Horizon, lower *Cynognathus* zone. Collector, R. Broom.

Diademodon platyrhinus Broom 1913.

Type 5518	Middle and anterior part of skull, with considerable part of lower jaw, of nearly mature *Diademodon,* showing evidences of a dental succession in the incisors, canines and premolars. Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 467, fig. 1. Locality, Winnaarsbaken, Burghersdorp dist., Cape Colony. Horizon, probably low down in the *Cynognathus* zone. Collector, R. Broom.

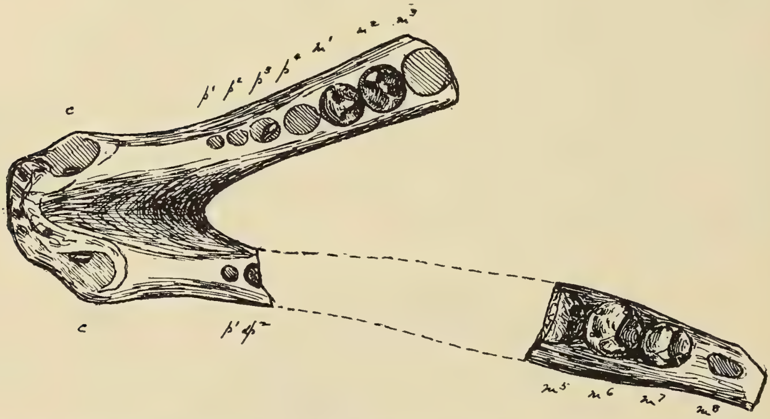


Fig. 45. *Diademodon platyrhinus* Broom. Type, No. 5518. × almost $\frac{5}{4}$. (From Bull. Amer. Mus. Nat. Hist.)

5519	Middle portion of skull of *D. platyrhinus,* showing a number of molars and premolars. Locality, Winnaarsbaken, Burghersdorp dist., Cape Colony. Horizon, probably low down in *Cynognathus* zone. Collector, R. Broom.

Ictidopsis elegans Broom 1912.

Type 5630	Complete skull of small Cynodont with the teeth well shown. Described and figured in Proc. Zool. Soc., 1912, p. 872, pl. xciii, fig. 22. Locality, Harrismith. Horizon, *Cynognathus* zone. Collector, A. van der Poel.

Lycognathus ferox Broom 1913.

Type 5538	Nearly complete skull with mandibles in position, but badly weathered on top. Described and figured in Bull. Amer. Mus. Nat. Hist., Vol. XXXII, 1913, p. 557, fig. 1.

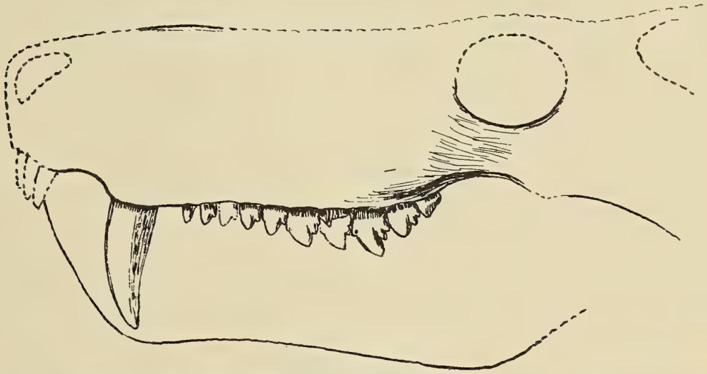


Fig. 46. *Lycognathus ferox* **Broom. Type, No. 5538. × $\frac{1}{3}$. (From Bull. Amer. Mus. Nat. Hist.)**

Locality, Winnaarsbaken, Burghersdorp dist., Cape Colony. Horizon, lower beds of *Cynognathus* zone. Collector, R. Broom.

Sesamodon browni Broom 1905.

Topotype Figured 5517	Anterior half of skull, much weathered. Shows the structure of the molar dentition fairly well. Figured in Amer. Mus. Jour., Vol. XIII, p. 346, December, 1913.

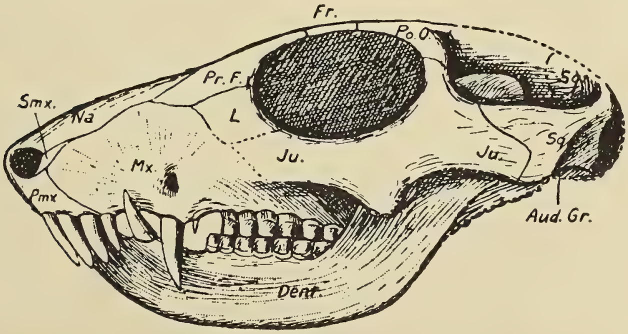


Fig. 47. *Sesamodon browni* **Broom. Topotype, No. 5517. (From Amer. Mus. Journ.)**

Locality, Aliwal North. Horizon, probably lower part of *Cynognathus* zone. Collector, Alfred Brown.

Trirachodon kannemeyeri Seeley 1895.

5320 Imperfect preorbital portion of skull, with mandible in position, showing many of the upper molars, and lower incisors and canines.
Locality, Burghersdorp. Horizon, *Cynognathus* zone. Collector, unknown.

?MESOSAURIA.

Heleosaurus scholtzi Broom 1907.

Type 5321 Small specimen which forms the type of *Heleosaurus scholtzi.* The other half of the specimen is in the S. African Museum.
Described and figured in Trans. S. Afr. Phil. Soc., Vol. XVIII, Pt. 1, 1907, p. 39, pl. iv, figs. 7–11.
Locality, Victoria West. Horizon, *Pareiasaurus* zone. Collector, T. J. R. Scholtz.

PHYTOSAURIA.

Erythrosuchus africanus Broom 1906.

5594 Portions of skull of *Erythrosuchus africanus* Broom.
Locality, Winnaarsbaken, Burghersdorp dist. Horizon, lower beds of *Cynognathus* zone. Collector, R. Broom.

5595 Portions of skeleton of *Erythrosuchus africanus* Broom. The humerus is smaller than in the type and is either a young individual or a distinct species.
Locality, Winnaarsbaken, Burghersdorp dist. Horizon, lower beds of *Cynognathus* zone. Collector, R. Broom.

5596 Scapula and coracoid of *Erythrosuchus africanus* Broom.
Locality, Winnaarsbaken, Burghersdorp dist. Horizon, lower beds of *Cynognathus* zone. Collector, R. Broom.

5597 Lower half of humerus of *Erythrosuchus africanus* Broom.
Locality, ?Rouxville dist., Orange Free State. Horizon, ?lower part of *Cynognathus* zone. Collector, R. Broom.

PSEUDOSUCHIA.

Euparkeria capensis Broom 1913.

Type 5547 Counter slab from the type specimen showing practically the complete set of abdominal ribs.

Locality, Aliwal North. Horizon, *Cynognathus* zone, probably rather low down. Collector, Alfred Brown.

Topotype 5548 Anterior portion of the tail showing about a dozen vertebræ, with chevrons, and a few dermal ossifications. The dermal ossifications along the spines of the vertebræ are paired. There appears to be also a row of ossifications along the ventral side.

Locality, Aliwal North. Horizon, *Cynognathus* zone. Collector, Alfred Brown.

? PSEUDOSUCHIA.

Youngina gracilis gen. et sp. nov.

Type 5561 This new genus and species is founded on the nearly perfect skull with many vertebræ and a few other skeletal fragments of a primitive Diaptosaurian reptile from the Upper Permian beds.

The skull which measures about 62 mm. in greatest length is somewhat intermediate in appearance between that of a Pseudosuchian and a modern crocodile. The snout is long and pointed and though somewhat crushed is probably rather broader than deep. There is a long row of very crocodile-like rounded teeth along the maxillary. In the specimen 16 are seen, but allowing for developing teeth in spaces between mature teeth the full number is probably 20 or 21.

There is no antorbital vacuity.

The orbits are large and look upwards and outwards. The distance between the orbits is about 8 mm. The preorbital portion of the skull is probably about 30 mm., and the antero-posterior diameter of the orbit is 15 mm.

There is a large pineal foramen. The supratemporal fossa is nearly half the size of the orbit and is bounded by the postfrontal, postorbital, squamosal, and parietal.

The occiput is remarkably archaic in having a large interparietal, possibly paired, and a pair of large tabulars.

A full description of the specimen with figures will be published later.

I have much pleasure in naming this extremely important primitive Diaptosaurian genus after John Young LL.D., Under Curator of the Hunterian Museum, Glasgow University, under whose kind assistance I first became enamoured of palæontology. When but a boy of 16 or so, Mr. Young was always so delighted to name for me the Carboniferous fossils collected on my Saturday rambles, and it is a delight to be able to lay even such a small stone on the cairn of this most remarkable man.

Locality, New Bethesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

THEROPODA.

Ætonyx palustris Broom 1911.

Type (Cast) 5623	Cast of humerus of type individual. Locality, Fouriesberg, Orange Free State. Horizon, Red beds. Collector, A. R. Walker.
5624	Shoulder girdles, vertebræ, manus and numerous other bones of possibly the same species. Locality, Fouriesberg, Orange Free State. Horizon, Red beds. Collector, R. Broom.

Algoasaurus bauri Broom 1904.

5631	Ungual phalanx of *Algoasaurus bauri* Broom. Part of the type individual. Locality, Despatch near Port Elizabeth. Horizon, Uitenhage series. Collector, R. Broom.

Plateosaurus stormbergensis sp. nov. (Figs. 48, 49.)

Type 5605	Portions of the skeleton of a large Carnivorous dinosaur from the top of the Stormberg. The remains are very weathered and most of the bones were too imperfect to be worth collecting. The best remains are a perfect right femur, a

nearly perfect right 1st metacarpal, portions of a number of vertebræ and portions of the pubes.

It is fortunate that the 1st metacarpal is known as this element is known in most of the medium size South African Theropoda and we can thus be quite certain that this Stormberg dinosaur is quite distinct from any of the previously known forms. It cannot be *Euskelesaurus browni* as in that form the femur is quite unlike that in the present type besides being very much larger. On the other hand it agrees so closely with some of the European species of *Plateosaurus,* especially *P. reiningeri,* that we may safely refer it to this genus.

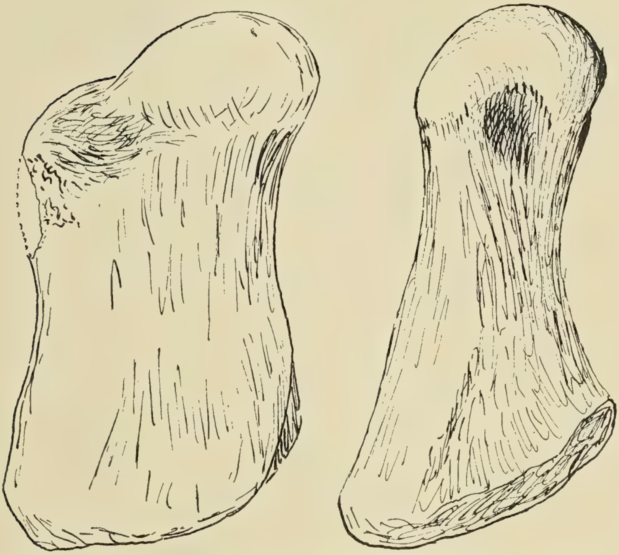


Fig. 48. Right first metacarpal of *Plateosaurus stormbergensis* Broom. Type, No. 5605. × $\frac{3}{4}$.

The 1st metacarpal differs from that of *Massospondylus* and agrees with that of *Plateosaurus* in being much longer than broad. It measures in greatest oblique length 104 mm., and in direct length 99 mm. The width across the distal articulation is 56 mm.

The femur resembles so closely the well known femora of the European species of *Plateosaurus* that besides giving figures it will be unnecessary to do more than give the principal measurements.

The greatest length of the femur is	554	mm.
Width of distal end	152	"
Length from head to top of median trochanter	232	"

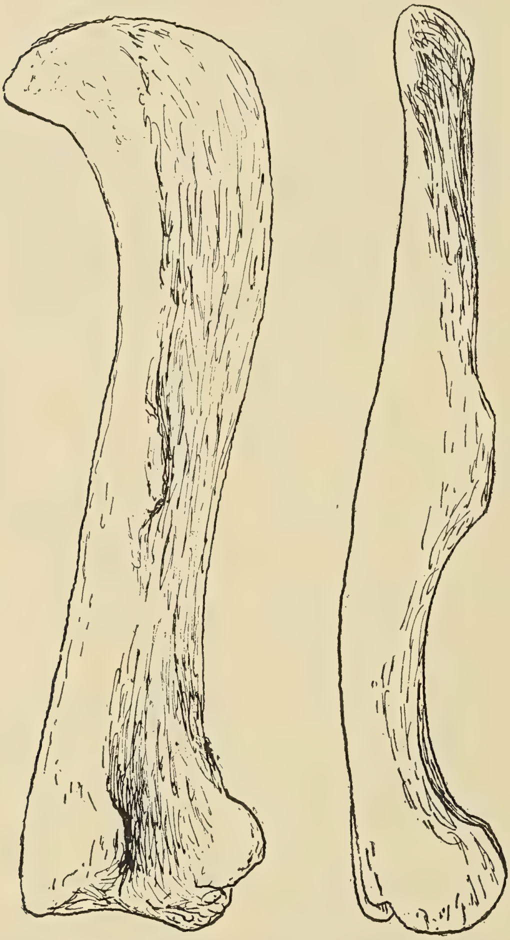
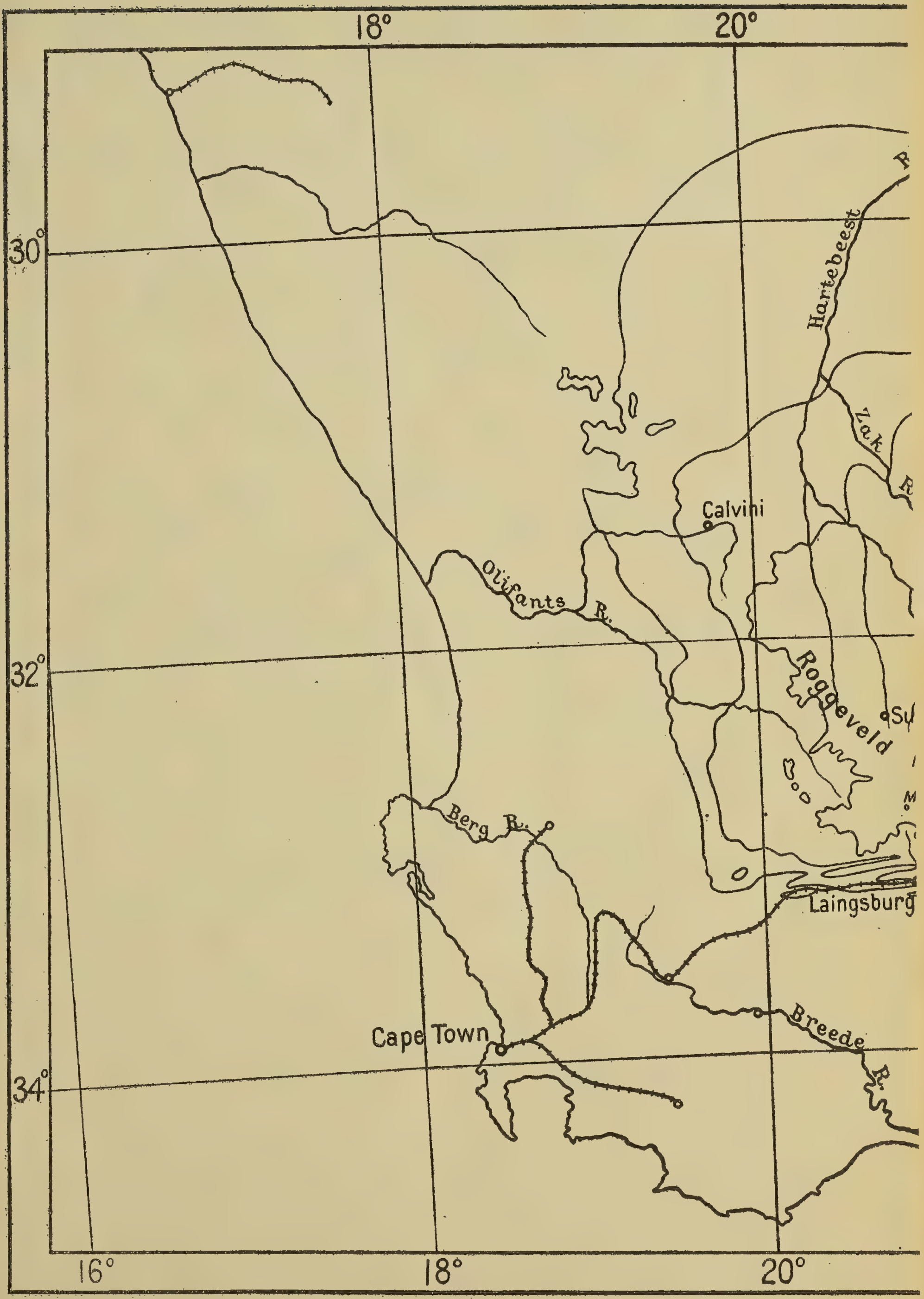


Fig. 49. Right femur of *Plateosaurus stormbergensis* Broom. Type, No. 5605. About $\frac{1}{5}$ natural size.

The pubis is remarkable for the great width of the anterior portions, in this differing from *Massospondylus* and its allies and resembling *Plateosaurus reiningeri.*

Locality, Witkop, Stormberg mountains. Horizon, probably base of Red beds (Lower Jurassic). Collector, R. Broom.


18°
20°
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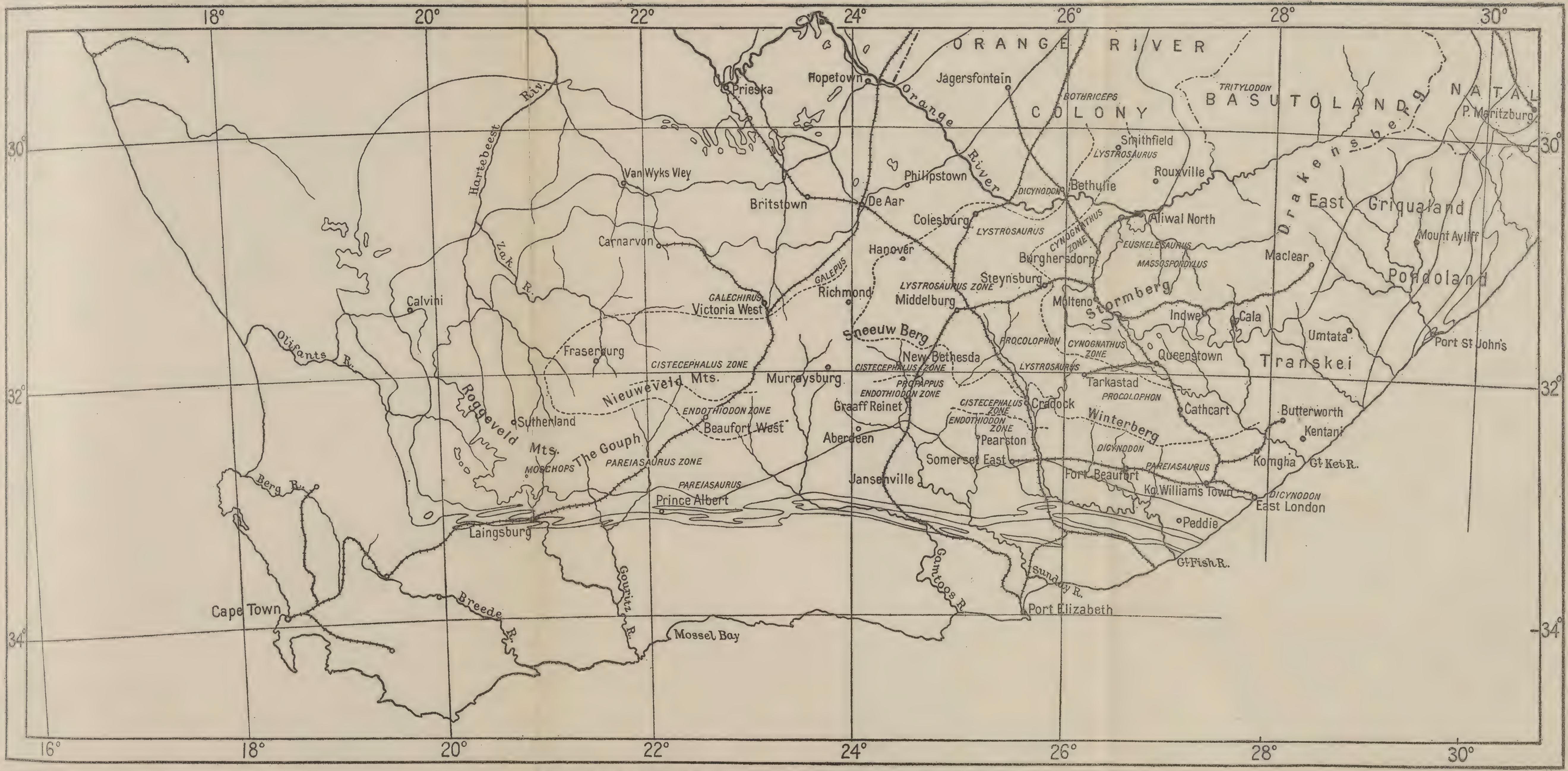
Hartebeest
Zak R.
Calvini
Olifants R.
Roggeveld
Su
Berg R.
Laingsburg
Cape Town
Breede R.
16°
18°
20°



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ORANGE RIVER
COLONY
BASUTOLAND
NATAL
P. Maritzburg
TRITYLODON
BOTHRICEPS
Prieska
Hopetown
Jagersfontein
Orange River
Smithfield
LYSTROSAURUS
Rouxville
Van Wyks Vley
Hartebeest Riv.
Philipstown
Britstown
De Aar
DICYNODON
Bethulie
Colesburg
LYSTROSAURUS
CYNOGNATHUS ZONE
Aliwal North
Drakensberg
East Griqualand
Mount Ayliff
Carnarvon
Zak R.
Hanover
Burghersdorp
EUSKELESAURUS
MASSOSPONDYLUS
Maclear
GALEPUS
LYSTROSAURUS ZONE
Steynsburg
Pondoland
Calvini
Richmond
Middelburg
Molteno
Stormberg
GALECHIRUS
Victoria West
Indwe
Cala
Sneeuw Berg
Umtata
Olifants R.
Fraserburg
New Bethesda
PROCOLOPHON
CYNOGNATHUS ZONE
Queenstown
Port St John's
Transkei
CISTECEPHALUS ZONE
Nieuweveld Mts.
Murraysburg
CISTECEPHALUS ZONE
LYSTROSAURUS
PROPAPPUS
ENDOTHIODON ZONE
Tarkastad
PROCOLOPHON
Roggeveld Mts.
Sutherland
ENDOTHIODON ZONE
Graaff Reinet
CISTECEPHALUS ZONE
ENDOTHIODON ZONE
Cradock
Winterberg
Cathcart
Butterworth
Kentani
Beaufort West
The Gouph
Aberdeen
Pearston
DICYNODON
MOSCHOPS
PAREIASAURUS ZONE
Somerset East
PAREIASAURUS
Komgha
Gt Kei R.
Berg R.
PAREIASAURUS
Jansenville
Fort Beaufort
K. Williams Town
DICYNODON
East London
Prince Albert
Peddie
Laingsburg
Gt Fish R.
Gamtoos R.
Sunday R.
Port Elizabeth
Cape Town
Breede R.
Gouritz R.
Mossel Bay

Fig. 50. Map of a portion of South Africa with the position of the various life zones indicated.

civ.
therl
Mts.
OSCH

Fig.

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY, VOL. XXV, PART II,
JANUARY, 1915.

ERRATA.

This paper was printed without the proof being submitted to the author, who was absent from America and could not be easily reached. He has since forwarded the following list of errata.

Page 106, line 5 from bottom, for *Rhinesuchus* read "*Myriodon.*"
" 107, " 21, for Dromasaurians read Dromasauria.
" 107, " 25, for probably the oldest known primitive Chelonian read possibly a form allied to the ancestral Chelonians.
" 107, " 3 from bottom, for *Dicyondon* read *Dicynodon.*
" 108, " 6, for Atherstonia read *Atherstonia.*
" 115, " 7, for Joubert read Rev. Mr. Joubert.
" 115, after line 7, insert "These Dromasaurians are fully figured in connection with my Croonian Lecture, Phil. Trans. Royal Soc., 1914.
" 116, line 11 from bottom, for relatively small and slender read moderately well developed.
" 116, " 7 from bottom, add There may have been 7 molars.
" 117, " 13, for J. T. R. Scholtz read T. J. R. Scholtz.
" 117, " 16, for regions read region.
" 118, " 15 from bottom, insert elsewhere at end of line.
" 118, " 14 " " for Mek read Nek.
" 119, " 15, for mandibles read mandible.
" 120, after line 8, insert Locality, Beaufort West. Collector, J. H. Whaits.
" 120, line 11, for small read fair sized.
" 124, legend for Fig. 10, add slightly restored.
" 126, line 12, for Neiuweveld read Nieuweveld.
" 136, lines 4 and 5, *dele* Amer. Mus. Journ. reference.
" 136, legend for Fig. 23, add to first line and made a little too large posteriorly.
" 136, between lines 7 and 8 from bottom, insert following:

Topotype 5635 (Fig. 27) A skull and nearly complete skeleton of *D. platyceps.* All the skeleton except the skull and remains of the fore limb were found in association and as mounted, except that the left hind limb lay almost directly backwards. The type skull and that mounted with this skeleton were found in the same stratum as the skeleton and each about a dozen yards from it, and about 10 yards from each other. Either may be the skull belonging to the skeleton. The front limb remains were also got in the same stratum but some yards away.

Figured in Amer. Mus. Journ., Vol. XIV, p. 136, Apr. 1914. Locality, /e New B~~o~~thesda. Horizon, *Cistecephalus* zone. Collector, R. Broom.

Page 138, legend for Fig. 27, for Type No. 5542 read Topotype No. 5635.
“ 142, line 5 from bottom, for Nieuwveld read Nieuweveld.
“ 145, “ 4, for Graaf Reinet read Graaff Reinet.
“ 147, “ 15, add Figured in Croonian Lecture, Phil. Trans. Roy. Soc., 1914.
“ 147, over marginal number 5632, insert Figured.
“ 157, “ “ “ 5622, *dele* Figured.
“ 157, legend for Fig. 44, for No. 5622 read Figure of the type in the S. African Museum. Slightly restored.
“ 157, lines 9 and 10 from bottom, *dele* the two lines.
“ 157, “ 8 and 2 from bottom, for Winnarsbaken read Winnaarsbaken.
“ 159, “ 1, for **Lycognathus** read **Lycochampsa.**
“ 159, “ 5, add under the name *Lycognathus ferox*. As this generic name is preoccupied (Dumeril, 1853) it has been changed to *Lycochampsa*.
“ 159, legend for Fig. 46, for *Lycognathus ferox* read *Lycochampsa ferox.*
“ 159, over marginal number 5517 *dele* Figured.
“ 159, last line, *dele* the line.
“ 159, legend for Fig. 47, for Topotype No. 5517, read Restoration of the nearly perfect type skull in A. Brown's collection.
“ 160, line 17, for PHYTOSAURIA read PELYCOSIMIA.
“ 160, last line, for R. Broom read unknown.
“ 161, line 14, for ?PSEUDOSUCHIA read EOSUCHIA.
“ 161, “ 15, for **Youngina gracilis** gen. et sp. nov. read **Youngina capensis** Broom 1914.
~~“ 161, over marginal number 5561, *dele* Type~~.
“ 161, line 16, for This new genus and species is founded on the read A.
“ 161, “ 4 from bottom, for 15 mm. read 17 mm.
“ 161, last line, for squamosal read tabular.
“ 162, line 5, for much read had.
“ 162, “ 10, for delighted read pleased.
“ 162, after line 15, insert SAUROPODA (as a center heading), and transfer **Algoasaurus bauri** (lines 6 to 10 from bottom) from THEROPODA to SAUROPODA.

(Continued from 4th page of cover.)

Part III.— Traditions of the Quinault Indians. By Livingston Farrand, assisted by W. S. Kahnweiler. Pp. 77–132. January, 1902. Price, $1.00.

Part IV.— Shell-Heaps of the Lower Fraser River. By Harlan I. Smith. Pp. 133–192, pll. vi–vii, and 60 text figures. March, 1903. Price, $1.00.

***Part** V.— The Lillooet Indians. By James Teit. Pp. 193–300, pll. viii and ix, 40 text figures. 1906. Price, $1.80.

***Part** VI.— Archæology of the Gulf of Georgia and Puget Sound. By Harlan I. Smith. Pp. 301–442, pll. x–xii, and 98 text figures. 1907. Price, $3.00.

***Part** VII.— The Shuswap. By James Teit. Pp. 443–789, pll. xiii–xiv, and 82 text figures. 1909. Price, $6.00.

Vol. V. Anthropology.

Jesup North Pacific Expedition, Vol. III.

Part I.— Kwakiutl Texts. By Franz Boas and George Hunt. Pp. 1–270. January, 1902. Price, $3.00.

Part II.— Kwakiutl Texts. By Franz Boas and George Hunt. Pp. 271–402. December, 1902. Price, $1.50.

***Part** III.— Kwakiutl Texts. By Franz Boas and George Hunt. Pp. 403–532. 1905. Price, $1.40.

Vol. VI. Anthropology.

Hyde Expedition.

The Night Chant, a Navaho Ceremony. By Washington Matthews. Pp. i–xvi, 1–332, pll. i–viii (5 colored), and 19 text figures. May, 1902. Price, $5.00.

Vol. VII. Anthropology (not yet completed).

Jesup North Pacific Expedition, Vol. IV.

Part I.— The Decorative Art of the Amur Tribes. By Berthold Laufer. Pp. 1–79, pll. i–xxxiii, and 24 text figures. December, 1901. Price, $3.00.

Vol. VIII. Anthropology.

** Jesup North Pacific Expedition, Vol. V.*

Part I.— Contributions to the Ethnology of the Haida. By John R. Swanton. Pp. 1–300, pll. i–xxvi, 4 maps, and 31 text figures. 1905. Price, $8.00.

Part II.— The Kwakiutl of Vancouver Island. By Franz Boas. Pp. 301–522, pll. xxvii–lii, and 142 text figures. 1909. Price, $10.00.

Vol. IX. Zoölogy and Palæontology.

Part I.— The Osteology of *Camposaurus* Cope. By Barnum Brown. Pp. 1–26, pll. i–v. December, 1905. Price, $2.00.

Part II.— The Phytosauria, with Especial Reference to *Mystriosuchus* and *Rhytiodon*. By J. H. McGregor. Pp. 27–101, pll. vi–xi, and 26 text figures. February, 1906. Price, $2.00.

Part III.—Studies on the Arthrodira. By Louis Hussakof. May, 1906. Pp. 103–154, pll. xii and xiii, and 25 text cuts. May, 1906. Price, $3.00.

Part IV. —The Conard Fissure, A Pleistocene Bone Deposit in Northern Arkansas, with Descriptions of two New Genera and twenty New Species of Mammals. By Barnum Brown. Pp. 155–208, pll. xiv–xxv, and 3 text-figures. 1907. Price, $2.50.

Part V.— Studies on Fossil Fishes (Sharks, Chimæroids, and Arthrodires). By Bashford Dean. Pp. 209–287, pll. xxvi–xli, and 65 text figures. February, 1909. Price, $3.50.

Part VI.— The Carnivora and Insectivora of the Bridger Basin, Middle Eocene. By W. D. Matthew. Pp. 289–567, pll. xlii–lii, and 118 text figures. August, 1909. Price, $5.00.

Vol. X. Anthropology.

** Jesup North Pacific Expedition, Vol. VI.*

Part I.— Religion and Myths of the Koryak. By W. Jochelson. Pp. 1–382, pll. i–xiii, 1 map, and 58 text figures. 1905. Price, $10.00.

Part II.— Material Culture and Social Organization of the Koryak. By W. Jochelson. Pp. 383–811, pll. xiv–xl, and 194 text figures. 1908. Price, $12.00.

Vol. XI. Anthropology.

**Jesup North Pacific Expedition, Vol. VII.*

Part I.— The Chuckchee: Material Culture. By W. Bogoras. Pp. 1–276, pll. i–xxxi, 1 map, and 199 text figures. 1904. Price, $8.00.

Part II.— The Chuckchee: Religion. By W. Bogoras. Pp. 277–536, pll. xxxii–xxxiv, and 101 text figures. 1907. Price, $4.00.

Part III.— The Chuckchee: Social Organization. By W. Bogoras. Pp. 537–733, pl. xxxv, and 1 text figure. 1909. Price, $3.00.

Vol. XII. Anthropology.

** Jesup North Pacific Expedition, Vol. VIII.*

Part I.— Chuckchee Mythology. By Waldemar Bogoras. Pp. 1–197, 1910. Price, $1.25.

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